JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXIV., No. 2638.] TUESDAY, DECEMBER 2, 1913. [65TH YEAR.

EDITORIAL NOTES.

Three Features for Next Session.

THE next session of Parliament promises to be an abnormal one in the history of gas legislation. There appears to be among the gas undertakings of the country a marked desire to modernize, and to consolidate position. There are, in fact, few of the notices for Gas Bills that do not foretell some special feature that will make them stand out from promotions along the common lines. The number of the Bills, too, will contribute to greater activity at Westminster; and for this those who devote themselves to parliamentary work will not be at all sorry. In the "JOURNAL" last week, attention was drawn to the particularly favourable feature of the notices in respect of the substitution of a calorific value standard for the illuminating power one—the Gaslight and Coke Company's proposed revision of their calorific standard and the suppression of the illuminating power one, the applications of the Liverpool and Margate Companies, and of the Middlesbrough and Ossett Corporations being notable. In all we can trace eighteen of the promoting gas concerns which are asking for a calorific power standard in lieu of the illuminating power one; and there are other Bills and Provisional Orders in which there is the mere announcement as to further provision being made for the testing of gas. Therefore, supplementing the eighteen known undertakings that are applying for a calorific standard, there may be others.

Another feature of the session will be the transfers of gas undertakings that are proposed both to companies and to local authorities. The Brentford Gas Company are proposing to do as some of the other Suburban Companies have done—extend their limits by the process of absorbing neighbouring gas undertakings. If the scheme goes through, the Staines and Egham and Sunbury Companies will disappear as separate concerns. There is the Margate Company, too, contemplating the extension of their business along the seacoast by purchasing part, or the whole, of the Broadstairs Gas Company's undertaking. The Longwood Gas Company have their eyes on the neighbouring Slaithwaite Company's property; the Riddings Gas Company are proposing to take under their charge the works and business of the Pinxton Gas Company; the Southend Company are entertaining the relief of the Southend Corporation of their Leigh-on-Sea Gas-Works; and the Wadhurst Gas Company are intending to acquire the Ticehurst concern, which has had such a chequered career. There is the Middlesbrough Corporation proposing to annex the North Ormesby Gas Company; and the Porthcawl, St. Annes-on-the-Sea, and Skegness District Councils have their eyes on the local gas companies' properties. The Cleckheaton District Council require a piece of the distribution system of the Bradford Corporation; and the Thornaby-on-Tees authority, a part of the Stockton-on-Tees distribution plant. Private gas undertakings are proposed to be abolished by purchase by the Ashington, the Ellesmere, and the Whitwell District Councils. The Bourne District Council, by Provisional Order, are also seeking powers of purchase. Thus acquisition and transfer business alone will make quite a substantial feature of next year's parliamentary business.

The third special feature will be the continued application on the part of gas undertakings for electricity supply powers, in order to make use of their favourable generating position in this regard. The examples of the past few sessions are bearing fruit. The Brentford Gas Company are proposing to take over the Egham District Electric Light Company's powers, and to secure authority (like the Tottenham Company last year when obtaining the Wood Green powers) to negotiate for the transfer of other electric supply undertakings. The South Suburban Gas Company, in their works development scheme on the banks of the Thames at Erith, are likely to have some electrical energy to spare; and they are asking (in conjunction with land purchase powers) for authorization to dispose of any such energy. Bearing upon this, it may be interesting to quote an item communicated to the "Electrical Times" by a firm of electrical plant manufacturers. We do not think there would be any difficulty on our part in naming that firm. They state that there are 214 gas-works now using electric-motors of an aggregate horse power of 35,000. There may be even more electric horse power in use than the firm are cognizant of. We are not sure whether our electrical friends look with admiration or envy upon the coolness with which the gas industry has adopted electrical energy for its travelling machinery, for the reason that there is nothing better for the purpose—not even gas. But, on the other hand, gas is generally used to generate the energy close to the seat of its application; and there is economy in this. There are some quite respectable electricity generating plants in gas-works to-day; and from some of them a few wrinkles might perhaps be obtained by electrical engineers. There are half-a-dozen other gas companies in for electricity supply powers—viz., the Alliance and Dublin, Deal and Walmer, Hightown, Leyland, Skegness, and Stone Companies.

On miscellaneous points, the Liverpool and Brentford Companies are going in for the consolidation or conversion of their capital. A sign of the times is the power sought by the City Corporation and the London County Council for the testing of high-pressure meters. There is a petrol air-gas scheme on the *tapis* for Balcombe; and a natural gas scheme for Calvert (Charndon). Fresh co-partnership shoots are breaking out here and there—according to the notices. Regarding Provisional Orders, there is also quite a respectable batch of these. On the whole, we look for a greater measure of life and interest in the coming session; and there will be many a hope expressed that the session will mark the beginning of a return to something approaching the old activity, though we are not much inclined to witness a revival of the bitter and useless fighting that at one time was all too common in the Committee rooms.

Gas not Responsible.

IT is possible to fully sympathize with Major Pringle over the difficult and responsible task with which he found himself confronted in connection with the inquiry, on behalf of the Board of Trade, into the Aisgill railway disaster. But we cannot admit that—with the condition in which the gas cylinders were found after the accident, with the knowledge as to the rate at which gas at close upon 100 lbs. pressure would escape from the cylinders under those conditions, and considering the fact that high-pressure gas is not in the habit of lingering about the point of its escape if it is free to the open air—the question as to the innocence or otherwise of gas of any part in the fiery destruction on that occasion was very difficult to determine. The deductions and conclusions of Major Pringle on this point show that determination was not a matter of serious trouble, and that his views, taken generally, were in the circumstances the only commonsense ones. We should have been extremely sorry had Major Pringle fallen a victim to the imaginings of lay individuals and to the rabid vapourings of interested electricians—that is to say, so far as the Aisgill catastrophe is directly concerned. Regarding his general recommendations as to the lighting of railway carriages, and the grounds for making them, we shall be having something more to say presently.

Major Pringle arrives at precisely the same opinion that we did immediately the evidence was available, that the big flash that was seen by more than one witness was due to the liberated gas that was drifting away from the scene of the catastrophe. We should like to emphasize the point in this connection, that there were three carriages destroyed—one electrically lighted, and two gas-lighted; and that the total

cubical capacity of the cylinders under one of the latter carriages was 23·98 feet, and that of the cylinders under the other, 47·94 feet. This is not a large amount of gas; and by the time of the accident some of it had been used. But the opinion of Major Pringle as to what happened to the gas is interesting. He believes that it did ignite immediately after the collision; and that "it is *quite possible* " that this flash, which lasted some seconds, set fire to some " of the surrounding material." It will be noticed that he does not speak with any certainty as to the ignition by the flash of inflammable material. When it is remembered that the inflammable material consisted of luggage and splintered woodwork, this suggests that flame contact, and not a momentary flash, would be required to do any mischief in the way of ignition. To support the theory of the Inspector, the flash, too, would have had to be under the carriages. But, if we are not mistaken, it was seen by one of the witnesses sitting in one of the carriages. It is therefore likely that the oil gas, liberated under high pressure, and so projected away from the carriages, was caught by a flying spark, and inflamed in the air, and this gave the momentary flash. However, gas is completely exonerated from having contributed to the real destructive conflagration, as any fire that the Inspector fancies may have been caused by the momentary flash, the evidence shows—and he concurs—was extinguished immediately, and that at least ten minutes elapsed (some of the witnesses named a longer interval) before any further fire was seen, by which time, the Inspector agrees, the gas must have been exhausted from the cylinders. All this supports the former contentions of the "JOURNAL;" and we cannot understand anybody, who has knowledge as to the action of compressed gas when suddenly liberated from a container, suggesting anything to the contrary. The further good point is made by Major Pringle that, had there been a continuous escape of gas, it would have been noticeable to the sense of smell; but not a single witness appears to have smelt gas. Gas is therefore completely discharged from having contributed to the horrors of this disaster; and it is the only rational finding that the circumstances permit. The contents of the colliding engine's ash-pan, and the heat radiated from the engine (which was practically buried in the wreckage), are adjudged to have been responsible for the real outbreak.

A more serious thing is the repeated urging by Major Pringle upon the railway companies as to the desirability of employing electricity as their standard illuminant. We have a right to ask, On what grounds? and to suggest that the Inspector should now reconsider the character of the evidence on which he bases his recommendations. He states that, in the past fifteen years, the Board of Trade have investigated thirteen railway accidents in which the wreckage caught fire. In three cases the fire was attributed to electricity, two to fire from the engines, six to gas, and two to gas and fire from the engines. Even assuming these figures to be correct, considering that at the present time the ratio of gas-lighted carriages to electrically lighted ones is nearly four to one, the statement as given does not disclose that, proportionately, gas has been such a terrible culprit. But we ask Major Pringle to seriously consider on two grounds whether the figures he has given are accurate. If he will turn to Appendix IV. of his report, and omit the Aisgill disaster, there are only four cases in which gas is directly accused of having contributed to—it is wrong to say, as the report does, "caused"—the fires. In the other cases, the words "apparently" and "attributed" are used, which at least admit the existence of some doubt. We believe sincerely that Major Pringle does not wish to adopt any dogmatic attitude in this matter, and that he desires to be perfectly fair. In this belief, we also ask him whether, reviewing the conditions of the Hawes Junction and other disasters in the light of the technical evidence advanced in the present case, mistakes were not made in, at any rate, some of them in attributing the fires to the liberation of high-pressure gas. We have contended for a recognition of the conditions that would prevail under the circumstances all through these inquiries, quite apart from the suppositions and evidence as to what agitated persons involved in the accident fancied that they saw during the turmoil and excitement of the time.

From quite another aspect, is it true, too, that from the danger point of view gas is less desirable as an illuminant on railways than electricity? Unseen fusings and short-circuitings are not pleasant things; and, from the standpoint of safety, the question of relative reliability of illuminants is not a negligible matter where trains are crowded with people mostly strangers to each other, and who do not carry a certificate of good character pinned conspicuously on their outside garments. Furthermore, the lower intrinsic brilliancy of the inverted incandescent gas mantle, and the quality of the light, are conveniences to the travelling and reading public. These are all points that should be taken into account. Major Pringle acknowledges that it would be unreasonable to expect, owing to the heavy expense of electrical equipment, the conversion from gas to electricity to take place immediately. What is more important is that there should be no accidents. It is the root of the danger to the public that is more important than anything else. If there were no accidents, there would be no fires, unless electrically generated; and, if there were no fires, there would not be the interested agitation there has been from the electrical camp for securing more business for those who supply electrical equipment Major Pringle admits that gas-cylinders are being improved; and he mentions the use of an automatic valve for preventing gas escaping when a cylinder is unperforated, and the connections are simply broken. Should the cylinders be fractured, the high-pressure gas escapes too quickly to do any harm. If the Board of Trade would make compulsory the use of these automatic valves, danger would be obviated when connections were broken. There is also the proposal for the fire-proofing of the floors of passenger coaches. It seems to us the Board of Trade have, within immediate reach, expeditious methods of making doubly sure that gas does not contribute to railway conflagrations in time of accident, without advising the depriving of the travelling public of the reliability and excellent quality of illumination provided by gas lighting, and the railway companies of its economy. In connection with the question of the quality of light, we suggest that Major Pringle might gain some information by reading our "Electricity Supply Memoranda" for Nov. 18.

On the whole, we are not at all disappointed with the report before us so far as it relates to the Aisgill disaster. The only part we do not like is the recommendation as to the desirability of conversion from gas to electricity for the lighting of railway coaches. We recognize the difference from the point of view of safety between moving vehicles and stationary conditions; but it is a debatable point (in regard to which we take the affirmative side) whether, on balance, gas is not a more desirable illuminant than electricity for even railway carriage lighting. With all respect, we must say that Major Pringle has not advanced any positive evidence to show that it is not.

A Record of Good Work.

THE International Meeting of Sulphate of Ammonia makers at the recent National Gas Exhibition (a report of the proceedings at which meeting was commenced last week) has a quadruple interest about it. The first point in it is the testimony that it affords as to the existence of a universal belief in the need, for the support of the sulphate of ammonia market, of propaganda work throughout the cultivable part of the world. The second is the silent remonstrance for outstanding British makers that we find in the unity of the sulphate of ammonia makers in other countries and their tonnage contributions to the work, compared with this country. The third is the proof adduced as to the value of the work that has been accomplished. And the fourth is the technical advice that is found in various portions of the proceedings. The information that was given by Sir Corbet Woodall and Mr. T. Milne, the Chairman of our home Sulphate of Ammonia Committee, as to the large increase in the production of sulphate of ammonia in this country and others ought to make those producers who are not at the the present time subscribing to the propaganda work pause, think, and then contribute. The make of the half-dozen principal producing countries has since 1900 increased by about one-third; and what the future is going to bring forth in the way of increased production, no one can foretell. We are all aware of the very rapid rate at which, of late years, the bye-product coke-ovens of this country have been contributing to the supply; yet at the end of 1911, out of 224 coking plants in this country, only 81 were of the recovery type. This gives some idea of the scope that there is, even under present carbonizing conditions, for developing supply. Yet we find nearly one-third of the production still unrepresented by subscription to the Committee, though the subscription per ton shows up poorly in contrast with

what other countries are doing. The value of the work of the Committee is not only unquestioned, but is unquestionable. The unit value of sulphate of ammonia, intrinsically greater than that of nitrate of soda, never over a long course of years reached an approximate commercial equality until the Committee set to work; and we are certain that, had it not been for the work of the Committee (whose activity increases with years and experience), the market values of the commodity would never have been maintained as they have been. So conscious and confident is Mr. Charles Carpenter, D.Sc., of the value of the work that he would not at all mind a call per ton towards its prosecution as high as the German contribution to the propaganda organization of that country—viz., 2s. 6d. per ton, compared with the 9d. of this country. Just consider what this 9d. means in comparison with a drop of shillings in the price per ton! In the report as published last week, there were two points of another order that are worthy of particular note—the one is the caution of Mr. Milne as to the detrimental effect upon use, the market, and the Committee's work of bad quality of sulphate of ammonia; and the other is Mr. Carpenter's testimony as to the value of sulphate of ammonia storage, so as to avoid having to dispose of produce when the market is not in a favourable state of receptivity.

Gas-Cooker Improvements, and Hot-Water Heating.

WHILE there is much controversy over the proper construction of gas-fires so as to secure the greatest amount of heat energy of the gas in proper form for room-warming, and at the same time provide fires that, under almost any local circumstances, in the matter of realizing hygienic conditions, leave nothing to chance, to flue-pipe lengths, or to the personal factor as expressed in the varying ability and commonsense of gas-fitters, the gas-cooker (excellent business contributor that it is) is sadly neglected. Therefore we are glad that Mr. F. S. Larkin treated of the subject as he did at the meeting of the Southern Junior Gas Association last Friday, as we think that good must result from investigations of the kind he has made and from the conclusions that are drawn from such research. There is undoubtedly room for the improvement of gas cooking-ovens. Even some of the best on the market might have their economy and general working efficiency still further enhanced; while some of the worst might just as well be placed on the scrap-heap and the reputation for cooking economy be preserved to the gas industry. When Mr. Larkin can show a variation in gas consumption of no less than 4·24 cubic feet per cubic foot of oven space in maintaining a temperature of 450° Fahr. for 1¾ hours with open-crown ovens, and a variation of 3·62 cubic feet per cubic foot of oven space with packed top ovens, there is ground for dissatisfaction, and a claim established for a higher efficiency if business connections are to be maintained with the firms that produce the proved extravagant forms of gas-cookers. There is not the slightest reason why one make of packed cooker of the same oven dimensions should show any worse efficiency, from the temperature maintenance point of view in relation to consumption, than any other. The differences are due to variable flue heat waste, and variable losses through temperature absorption by the metal and through convection.

There is considerable divergence of manufacturing practice in regard to the size of the flue-outlets of ovens; and there does not appear to be any standard relation between the outlets and maximum gas consumption. Some are too large; and occasionally one meets with an oven the flue-outlet of which is too small for the work that is demanded of it. Hand dampers are worse than useless, if the cook is expected to employ them for regulating the outlet in accordance with the consumption—they are, in fact, as valueless as oven thermometers for all the use to which they are put. But Mr. Larkin makes the suggestion that a damper should be provided for the flue-outlet, and should be regulated (but never entirely closed) by the mere operation of the tap controlling the gas consumption. This would certainly be an improvement upon the crudeness of the invariable flue-outlet; but it must not be forgotten that gas differs in different places and ovens are used for different purposes, and the different purposes produce variable quantities of evaporation. The flue-outlet under different circumstances has to deal with variable conditions; but Mr. Larkin finds that a square inch of flue area per cubic foot of oven space gives very satisfactory results at varying pressures and consumptions. However, his point is that, if we cannot get to absolute perfection, let us get as near as we can to it, so as to produce further economy for the householder even with the cheap B.Th.U. of our gas supply. The position of the oven-burners is another point of criticism; and Mr. Larkin suggests that they should be so situated that, should there be any throttling of the flue-outlet, the flames would not be smothered. He also urges that provision should be made for obtaining the primary air for the burners outside the oven itself. He further prefers that the crown of the oven should be packed, and a direct flue-outlet provided. If the first table in the paper is examined, it will be seen that, comparing the packed crown oven with the open crown one, there is a material saving in consumption per cubic foot of oven space in favour of the former.

There is one other general point. Mr. Larkin speaks of the customary hand method of determining by the housewife or cook the sufficiency or otherwise of oven temperatures. Now could not some guide be provided for the cook apart from the hand method, and apart from thermometers? In the case of some of the electric-cookers, the current can be switched full-on, three-quarters-on, half-on, or a quarter-on; and at these different switchings, allowing for temperature overlappings, reproduction of different temperatures (at given room temperatures) must, with a fair amount of certainty, result, although the range of varied temperatures is not so great as can be realized by the use of the gas-tap. In the case of the gas-oven, why could not a lever tap be provided with a half-circle scale similar to those supplied with some types of gas-fires, so as to permit the cook to definitely turn the gas three-quarters on, half-on, or quarter-on—in fact, allow, if desired, the consumption to be turned on definitely to any point between a given low consumption and full-on? We see no reason why this should not be done. It would certainly afford some guide, beyond the traditional one, to the obtaining of what is required

An equally interesting section of the paper is that in which Mr. Larkin presents the case for adopting his system of heating water during cooking by means of a coil of pipes fitted in the oven. While congratulating him on the work he has done in this direction with the view of securing an additional economy for the householder, we are not convinced that his proposal can have anything more than a very limited convenience, while adding to the structural parts of the oven, and therefore to the initial cost and, in a measure, to the upkeep. In the first place, it must be admitted that, within limits, Mr. Larkin does show a gas economy in relation to the temperature of the water—that is, by examining his figures from the theoretical thermal standpoint, as near as is possible in the absence of information as to the initial temperature of the water. He tells us that he can during cooking operations raise 1½ gallons of water to a temperature of 150° Fahr. Assuming the water was at the high initial temperature of 60°, the increase in temperature would be 90°; and he says that this increase was accomplished by burning only 2 cubic feet of gas in excess of the quantity consumed for the same operations without water heating. While recognizing the indefiniteness of the measurements in relation to work done in the oven and the absence of information as to the prevailing conditions, this small extra consumption shows that heat was passed into the water that would otherwise have been lost—seeing that heating to the temperature named 1½ gallons of water by gas under conditions of almost calorimetric exactitude would have required close upon 3 cubic feet of London gas. Therefore for work done there was heat economy. He suggests that the same quantity of water would have required, heating it in kettles to the named temperature, 5 to 6 feet of gas. There is another striking example—the heating of 6 gallons of water to a temperature of 165° Fahr., with an increase in the consumption of gas of only 3·7 cubic feet over the normal consumption. This is very remarkable. In this case, Mr. Larkin suggests that there is a saving of 20 cubic feet compared with heating by kettles. We do not expect to get laboratory refinement from gas heating by kettles; but to heat in the home 6 gallons of water by kettles would be wasteful (if a frequent) process. People requiring 6 gallons of water would utilize a more expeditious method, and one with a greater thermal efficiency than can be obtained from kettle work.

It is clear, however, that, with Mr. Larkin's method, there are temperature limitations; and to obtain boiling water for the proper cleansing of greasy plates and dishes, pots and pans, it would have to be supplemented by a more vigorous method of heating. Moreover, hot water is not always wanted every time the oven is in use. Have, too, the coils

of pipes been tried on more than the London water? If so, has there been with any of the waters a choking of the pipes? Do the coils decrease the oven capacity—say, in the case where 6 gallons of hot water are available during cooking. When one comes to think of the matter all round, between advantage and disadvantage, there does not seem to be a great deal of balance of advantage. However, we admit that this is speaking without having tried this water-heating plan; and if Mr. Larkin can show there is any real permanent and all-round advantage in it as compared with the separate heating of water by means of gas, we shall be the first to compliment him. We confess we are interested in his efforts; and these comments will perhaps give him an opportunity for supplementing his paper.

Anglo-American Exhibition.

It is understood from an authoritative source that the Electricity Supply Publicity Committee are not contemplating any representation at the Anglo-American Exhibition, which appears to be substantial evidence that the London Electricity Supply Companies are not intending to make a display on the domestic side. But this does not dispose of the question as to whether or not there will be an organized electric display at Shepherd's Bush next year. There are other bodies associated with the electricity supply industry; but if there is on the *tapis* any scheme for a display at all, it is being kept well concealed on the electrical side, and, maybe, it will only resolve itself into one for the display of electrical plant and not for prosecuting the domestic electrification campaign.

A Seat at the Board Table.

We are glad to see the very proper tendency of gas company administrations to elect their chief official on retirement to a seat at the Board. Of course, it depends on officials themselves and their record whether the application in their cases of the growing practice is a good thing for the companies. At any rate, it is one of the greatest honours that can be done an official, when the time arrives for him to lay down his official responsibilities, to be invited to come up higher. It follows, too, that his services at the Board should be, if he be of the right sort, of inestimable value to the directorate; for there can be no one on the Board who can claim to know so much of the inner and practical workings of the concern, as an old (in service, not necessarily in years), loyal, and trusted chief officer who has been in daily touch with the work year in and year out. Such are Mr. J. T. Jolliffe, of Ipswich, and Mr. George Thornton Andrews, of Swansea; and their (when their projected retirements from official service come about) elevation to the Boards of their respective Companies is something upon which the two Companies, as well as themselves, may be congratulated. Reference to these two forthcoming events, which form such a notable illustration of a right line of action, was made in our "Personal" notes last week.

Ashborne Gas-Works Transfer.

After fully hearing both sides during the recent arbitration proceedings in London, as reported in the "JOURNAL" at the time, the Umpire (Mr. Ernest Moon, K.C.) has fixed the price which is to be paid by the Ashborne Urban District Council for the undertaking of the local Gas Company. The amount awarded by him is £39,667; and he points out that, in arriving at this figure, regard has been had to the obligation of the Council to make a further payment to the Company in terms of the Act of 1912. In connection with proceedings of this character, of course, it is not the custom of umpires to state to what extent they adopt the views of either side on the different matters discussed at the hearing. All that is available on which to base conclusions with regard to the point is the total figure, and this obviously may be the result of accepting the claimants' contentions in some respects, and those of the respondents in others. In the course of the Ashborne case, for instance, there was an extremely interesting discussion on the proper allowance to be made for repairs and maintenance of works, mains, meters, and so on; and a good deal of attention was also devoted to the question of what is a suitable provision for storage in relation to the maximum day's make. There were other matters applying particularly to the works in question, over which counsel and witnesses contended; and then there was the multiplier to be taken—one side claiming 25 years' purchase, the other urging that 20 years would be a fair basis. Altogether, the Umpire had plenty of points to which to direct his attention, and some substantial resulting differences to consider; for while the total claim of the Company amounted to nearly £60,000, the valuation for the Council came out at just under £27,000.

District Councils and Publicity.

There have been recent signs of restlessness on the part of our electrical friends regarding the contributions of local authorities to schemes for carrying on publicity work. Urban District Councils have hitherto been loth to contribute to publicity organizations, for the vision of surcharges when the District Auditor came along always loomed up in ugly shape before the councillors. Our electrical competitors soon got wind of what the British Commercial Gas Association had done in approaching the Local Government Board, and had some inkling, though not perfect information, as to the nature of the letter received from the Board by Sir Corbet Woodall. In consequence, they, too, approached the Board, through the Associated Municipal Electrical Engineers of Greater London, and asked whether it might be taken that the reply received by Sir Corbet would apply to the electrical undertakings as well as to gas undertakings under the control of urban district councils. The correspondence that ensued will be found in our "Miscellaneous News" columns; and it will be seen therefrom that what applies to district council gas undertakings also applies to electrical concerns under like management. The letters from the Local Government Board are guarded. They have no power to legalize contributions to the funds of publicity associations, nor have they power to instruct district auditors to allow them. But the Board are advised by the Law Officers of the Crown that publications containing information immediately connected with the discharge by the authorities of their duties, or that is likely to enable them to discharge these duties more efficiently, may legally be purchased by the authority. The question as to the legality and reasonableness of the expenditure incurred in the purchase of the publications would, in the case of a local authority whose accounts are subject to examination by a district auditor, be one for consideration in the first instance by the auditor at the audit. We fancy our electrical friends thought the correspondence with the Local Government Board went further than this. However that may be, the electrical industry again follows the lead of the gas industry.

The Last City and Guilds Examinations.

In another part of the "JOURNAL" will be found some particulars in regard to the last examinations conducted by the City and Guilds of London Institute in the two subjects in which readers are specially interested, as well as a few figures showing the extent of the Institute's work, taken from the report just issued. There are now altogether 448 centres, and from them were sent up 21,878 candidates, of whom 13,618 passed. Turning to our own subjects, there was an augmentation of numbers in both of them; the totals having risen from 802 to 1042, and of the candidates from 667 to 816, chiefly through the increase under the heading of "Gas Supply." Out of the 278 candidates who submitted themselves for examination in "Gas Engineering," 193 passed and 85 failed, or 30·5 per cent.; while of the 538 who had taken up "Gas Supply," 423 passed and 115 failed, or 21·3 per cent. It is gratifying to learn from the report of Mr. Thomas Glover, the Examiner in the first-named subject, that the quality of the work done by the students in the lower grade was "well above the average of past years." Unfortunately, this cannot be said of much of the work of the candidates in the Final Grade. The impression left upon the Examiner is that the chemistry of gas maunfacture is well taught, but that there is room for improvement in the methods adopted for preparing students for understanding engineering questions. We commend to the notice of teachers and others the last lines of Mr. Glover's report.

Candidates' Weak Points—A Suggestion.

The Examiner in "Gas Supply" (Mr. Water Hole) refers to the large number of candidates who passed first class. He says the general results of the examinations speak well for the preparatory work done by the students, and the excellence of the tuition given. Further, the answers in a large number of cases "bore welcome evidence of careful perusal of recent papers and discussions re-

ported in the Technical Press." Another noteworthy feature was, he says, not only the firm grip of first principles, but the power on the part of the students to apply them to new conditions. It must have been gratifying to him to be able to place this on record. The principal weaknesses shown were in chemistry and calculations; and he thinks it would be well for teachers to give students a certain amount of training in the simple arithmetical calculations likely to be necessary, or that students should be required to possess some knowledge of elementary mathematics before being sent up for examination. Possibly the teachers may consider that the students should have been properly prepared in this respect before coming to them. But it seems, from some remarks in the report on the general work of the Institute, that in no less than ten subjects the Examiners have had to call attention to the difficulty that simple arithmetical calculations present to many candidatrs—a defect which can only be attributed to insufficient preliminary training. Let us hope next year's report will bear evidence of improvement in this matter, now that attention has been directed to it.

PERSONAL.

Mr. Douglas Forbes Irving, son of Mr. Daniel Irving, M.Inst.C.E., Engineer of the Bristol Gas Company, passed the recent examination for the associate membership of the Institution of Civil Engineers. He was a former student of the Faculty of Engineering of the Bristol University.

From among 87 applicants for the position of Engineer and Manager of the Hereford Corporation Gas-Works, the Gas Committee interviewed three candidates; and subsequently they decided to send up all three names to the Town Council in order of merit, with a recommendation that Mr. Charles V. Townsend (the Assistant Manager of the Wakefield Gas Company) be appointed. The matter is to be decided by the Council to-day.

Mr. Frederick Taylor, Secretary of the Warrington Corporation Gas Department, who has for some time been confined to his house through ill-health, has resigned his position. In accepting the resignation, the Gas Committee have placed on record their appreciation of Mr. Taylor's long and faithful services. He has held the appointment since July, 1888, prior to which year he was in the service of the Warrington Gas Company. By his retirement the Corporation lose a valued official.

The position of Engineer and Manager to the Chichester Gas Company (which was rendered vacant by the death of Mr. T. E. Pye) has been filled by the appointment of Mr. T. N. Ritson, Assoc.M.Inst.C.E., who has for some little time been associated with the Birtley Iron Company. It will be remembered that Mr. Ritson, 1902, succeeded Mr. W. A. Valon as Gas and Water Engineer to the Ramsgate Corporation, with whom he remained until 1907. Previous to this he was for ten years at Kendal.

At the offices of the Ipswich Gas Company last Thursday, Mr. C. E. Russell, the senior rental clerk, was asked by the staff to accept a handsome marble clock and a pair of ornaments, as a tangible expression of their good-will. The presentation was made by Mr. J. T. Jolliffe, the Engineer and Manager, who said Mr. Russell was about to leave, after twelve years' service, to take the position of chief clerk to the Maidstone Gas Company; and his colleagues could not allow him to go without offering him their best wishes. In acknowledging the gifts, Mr. Russell said they would remind him of the happy time he had spent at Ipswich.

OBITUARY.

We regret to record the sudden death on Saturday last, in his sixtieth year, of Mr. Salamon Falk, of the firm of Messrs. Falk, Stadelmann, and Co., Limited, of Farringdon Road. Deceased came to England in 1878, and was associated with the firm of Julius Ungar, in Commercial Street, E.C.; but in 1883 he commenced business on his own account, at 38, Basinghall Street, as agent for the United Kingdom and the Colonies for Jean Stadelmann and Co., of Nuremberg, manufacturers of gas-burners, &c. From Basinghall Street he removed to Colonial Building, Hatton Garden, where his business developed into a more general one of lighting fittings and accessories for oil, gas, and electricity. Here he was joined by his two brothers, and in 1887 he formed a limited liability company, with which Jean Stadelmann and Co. were incorporated, and removed to larger premises in the Farringdon Road. In 1889 they moved to still more commodious premises in the same thoroughfare, and in the course of time opened a branch in Glasgow and another in Manchester. Mr. Falk brought out the "Veritas" lamp, and the firm established works at Earlsfield, S.W., for the manufacture of these and other mantles. While exercising control as Managing Director of the Farringdon Street concern, Mr. Falk had of late been less closely engaged in the business than before. His death was due to heart failure, and it will be felt by many as the removal of an old and personal friend.

NEW MANAGEMENT AT SWANSEA.

Following our announcement last week in regard to the retirement of Mr. George Andrews from the position of Engineer, Manager, and Secretary of the Swansea Gaslight Company, we are now able to state that the Directors have appointed Mr. Reginald G. Clarry, their present Assistant Engineer and Manager, as his successor. Mr. Clarry went to Swansea about five years ago, having been selected from among eighty candidates, and under Mr. Andrews has taken a very active part in the management, especially during his chief's recent illness and convalescence, over the whole of which period he had full charge, and in that capacity gave satisfaction to the Directors.

Mr. Reginald Clarry's career has been one of sustained activity since leaving school sixteen years ago. Commencing under his father, Mr. George Clarry, the present General Manager and Secretary of the Cardiff Gaslight and Coke Company, he found the engineering side more suited to his taste. His engineering training commenced with workshop experience. After this he became an articled pupil at the Beckton works of the Gaslight and Coke Company, on the completion of which he went through a course of training in the distribution and commercial sales departments of the Company. Soon afterwards he was appointed by the Directors of the Cardiff Gas Company to the position of Works Superintendent at their Grangetown station; but in less than twelve months he was back again at Beckton, being afterwards promoted to Deputy-Engineer, resident at the Gaslight and Coke Company's Shoreditch works, where he remained until going to Swansea. Mr. Clarry holds numerous certificates, including first-class honours in Gas Manufacture, Chemistry, Building Construction, &c. He also obtained a first-class certificate in the Society of Arts Accountancy Examination during the time he was engaged in the secretarial department of the Cardiff Gas Company.

The district supplied by the Swansea Gas Company is extensive, and well filled with a large and growing industrial population; and it is felt that with a progressive policy the gas supply will rapidly increase. At present the Directors have an important scheme of extensions under consideration; so that Mr. Clarry is sure in the near future to find ample scope for his energies.

GAS ACTS FOR 1913.

[Third Article.]

The work of reviewing the Acts promoted by local authorities which dealt wholly or in part with gas affairs is considerably lightened by what transpired during the session. The Brumby and Frodingham District Council Transfer Bill was withdrawn; the only clause in the Leeds Bill in which we were concerned (providing for central suspension of street-lamps) has been deleted; the Windermere District Council Transfer Bill was withdrawn; and the citizens of York vetoed the proposal of the City Council to become the possessors of the gas undertaking. Again we shall only notify any changes effected in the provisions of the successful measures since they were surveyed in original form on Jan. 28 last.

The Barry District Council have secured the extension of their limits of gas supply as sought, as well as all the other powers of normal character, as mentioned in the review of the Bill. They have not, however, been successful in carrying through the proposed standard illuminating power of only 12 candles; 15 candles being the prescribed standard in the Act. [*Parliamentary Agents: Messrs. Torr and Co.*]

The clause in the Coventry Corporation Bill proposing an extension of the gas limits partly succeeded; Binley and other slices of territory being removed from the proposal. In the Act we see clauses protecting the Warwickshire County Council. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Act of the Leicester Corporation shows that they have been granted the permission sought to increase the gas reserve fund to an amount not exceeding £150,000. [*Parliamentary Agents: Messrs. Dyson and Co.*]

We do not find in the Liverpool Corporation Act the clause by which they sought to obtain satisfaction for damage done to lamp posts or lanterns by drivers of vehicles, by summoning them and their employers before a justice. Clauses, however, appear for regulating the sale of coke by retailers; the object being to protect the public against being defrauded in respect of weight or measure. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The clause in the London County Council Act providing for the attachment of brackets, &c., to buildings, for the purposes of public lighting has been greatly extended. In view of the growing favour of central suspension, and as the clause, and a protecting one for railway companies, will probably be largely adopted as models in future, we reproduce them *in extenso*:

Attachment of Brackets, &c., to Buildings for Public Lighting.

Any Metropolitan Borough Council may with the consent of the owner of any building situate within their borough attach to that building such brackets, wires, pipes, lamps, and apparatus as may be necessary or convenient for the lighting of any street in that borough:

Provided that

(1) Where in the opinion of the Metropolitan Borough Council

any consent under this section is unreasonably refused, they may appeal to a Petty Sessional Court, who shall have power, having regard to the character of the building and to the other circumstances of the case, to allow the attachment subject to such terms as to compensation or rent and otherwise as they may think reasonable, or to disallow the same, and may determine by which of the parties the costs of the appeal are to be paid:

(2) Any consent of an owner and any order of a Petty Sessional Court under this section shall not have effect after that owner ceases to be in possession of the building; but any attachments fixed under the provisions of this section shall not be removed until the expiration of three months after any subsequent owner shall have given to the Metropolitan Borough Council notice in writing requiring the attachments to be removed. Where such notice is given, the preceding provisions of this section shall apply, and the Petty Sessional Court shall have the same powers as under proviso (1):

(3) The owner may require the Metropolitan Borough Council to temporarily remove the attachments where necessary during any reconstruction or repair of the building.

For the purposes of this section, any occupier of a building whose tenancy exceeds one year unexpired, and in the case of any other tenancy the person receiving the rack-rent, shall be deemed to be the owner, except in the case of any building in which any Railway Company possess any legal or equitable estate or interest, and which is situate over, or partly over, any station belonging to that Company, in which case such Railway Company shall be deemed to be the owner thereof for the purposes of this section and the section of this Act of which the marginal note is "For Protection of Railway Companies."

For Protection of Railway Companies.

(1) Nothing in the Section of this Act of which the marginal note is "Attachment of Brackets, &c, to Buildings for Public Lighting" shall authorize any Metropolitan Borough Council to affix brackets, wires, pipes, lamps, or apparatus to the structure of any railway bridge or viaduct belonging to any railway company without the previous consent in writing of such company.

(2) In the case of any building of which a railway company are the owners for the purposes of the said section, any question which, pursuant to the said section, is to be determined by a Petty Sessional Court shall, in lieu thereof, be referred to, and determined by, an engineer to be agreed on by the parties to such question, or failing such agreement to be appointed on the application of either party by the President of the Institution of Civil Engineers; and the provisions of the Arbitration Act 1889 shall apply to any such reference. Any engineer to whom any such question is referred shall (in addition to any other powers vested in him under the Arbitration Act 1889) have all the like powers as are by the said section conferred upon a Petty Sessional Court, and for the purposes of the said section the award of such engineer shall be deemed to be equivalent to an Order of a Petty Sessional Court.

There are no other clauses that will specially interest "JOURNAL" readers. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The gas section of the Lymm District Council Bill has gone through practically intact; the clauses being all of normal character. It has been enacted that the price of gas is not at any time to exceed 5s. per 1000 cubic feet. Borrowing powers to the amount of £20,000 have been granted for extensions and improvements; the repayment period being forty years. [*Parliamentary Agents: Messrs. Butterworth and Co.*]

The Morley Corporation Act shows that the calorific value clauses have gone through, without any departure from the particulars given in the "JOURNAL" for Jan. 28 last. [*Parliamentary Agents: Messrs. Baker and Sons.*]

The Mynyddislwyn District Council are now in possession of the gas supply of their area. Prior Acts had conferred the right to obtain powers without opposition for the purchase of the portions of the Bedwellty and Risca gas undertakings lying within the Council's administrative area. Our extended notice of the Bill on Jan. 28 last gave much information concerning the scheme, including mention of the terms on which the part of the Bedwellty undertaking was to be transferred. Subsequently a contract was effected with the Risca Council, under which it was agreed that the consideration for the sale of the portion of the Risca undertaking should be £16,308 7s. 1d., and, in addition, the amount of the expenditure incurred by the vendors on pipes, mains, stoves, cookers, meters, fittings, and other apparatus within Mynyddislwyn district for the supply of gas between March 31 last and the day of transfer. The agreement also provided for the supply of gas in bulk from Risca. This portion of the agreement is for a period of seven years; and the amount of gas to be taken is to be not less than 7 million cubic feet, which is to be paid for at the rate of 3s. per 1000 cubic feet. The purchasers may require the supply up to 12 million cubic feet in any one year. The clause has disappeared by which power was sought to acquire an easement over a railway siding, and for the affording of facilities by the London and North-Western Railway Company for traffic to and from the gas-works. The other particulars regarding gas-supply powers as given when noticing the Bill are the same as appear in the Act. The financial provisions provide for the borrowing (in addition to the sums required for the purchase of the portions of the two concerns) of £1150 for the acquisition of lands and easements; of £11,150 for the erection of gas-works; of £7520 for new gas-mains and the extension and improvement of gas-mains; of £5080 for new services, meters, stoves, and fittings; and of £1000 as working capital. Power is granted to the borrowing of additional money with the consent of the Local Government Board. The repayment periods fixed are for the purchase money, twenty-five years; for the money required for lands and easements, sixty years; for the erection of gas-works, forty years; for mains, thirty years; for services, meters, stoves, &c., twenty years; and for working capital, ten years. [*Parliamentary Agents: Messrs. Rees and Freres.*]

What is known as the Silloth Gas Act is the result of a "late" Bill, which was therefore not noticed when reviewing the measures as introduced last January. The Act empowers the Holme Cultram District Council to purchase certain gas-works belonging to the North British Railway Company, and to supply gas within the urban district. The works are situated at Silloth, the inhabitants of which have been supplied by the Railway Company. The transfer is by agreement. The consideration is to be the payment to the Company of £2400, *plus* such sum as is agreed, or determined by arbitration, as the value of the coal, coke, lime, gas, residuals, and stores. Provision is also made for a tramway between a railway siding and the works. The Railway Company agree to take a minimum supply of 800,000 cubic feet of gas per annum, for each of the five years ensuing after transfer day; and they are to pay for it not exceeding 4s. 2d. per 1000 cubic feet while the ordinary price of gas is at or exceeding 5s. per 1000 cubic feet, and a proportionately less charge whenever the price to the general public is below 5s. The prescribed quality of the gas is 14 candles. The maximum price per 1000 cubic feet has been fixed at 5s. 6d.; and the price for public lighting is not to be less than that charged to private consumers by more than 10 per cent. The Council are empowered to borrow the money necessary for the purchase; the repayment period being thirty years. A sum of £500 is allowed for working capital, to be repaid in ten years; and the borrowing of a sum of £1000 is authorized for reconstruction and improvement work. As to the disposal of the revenue, the usual provisions are made; but in regard to the transfer of surpluses to the district fund, it is provided that this shall not be done so long as the price exceeds 4s. per 1000 cubic feet. [*Parliamentary Agents: Messrs. Baker and Sons.*]

The Act of the West Bromwich Corporation shows that they carried their proposal for a 13-candle gas; and suitable flat-flame burners for this quality are to be provided where required for a period of two years. The burners of the prepayment gas consumers are to be changed as soon as reasonably practicable. The Corporation are relieved from the obligation to purify for sulphur compounds other than sulphuretted hydrogen. The London and North-Western Railway Company have secured protecting clauses. The three stand-by clause proposals in the Bill have been reduced to a single one of ordinary character, relating to both gas and electricity. In connection with street lighting, power is taken to attach to any building, with the consent of the owner, any brackets, wires, &c., required. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

ELECTRICITY SUPPLY MEMORANDA.

A FEW weeks since, there appeared an article in the "Electrical Review" entitled "The Value of a Sense of Proportion." In the course of it, these words occurred: "It would be well if this great quality of the sense of proportion could be acquired and be maintained, both individually and collectively, by the men who direct the operations of the great forces which we are wont to mass under the title of electrical engineering. In times past strenuous conflicts have been waged over points which, *in the light of cooler judgment, and subsequent experience*, have proved to be comparatively valueless and insignificant." Then follows a reference to the sacrifices of human strength, brains, and money that have been made through lack of a sense of proportion, the writer adding "obviously it would be invidious to particularize." Not long before, an article appeared in our contemporary, with a strange hysterical note in its opening paragraph. The article was headed, "Lest we Forget," and was prompted by the fact that lives had been lost in the Aisgill disaster, but more particularly because gas was used on the train. We dealt with the article in our issue for Sept. 16 (p. 748). The "Review" has never excited itself in similar way over loss of life from electrical causes. In the issue of our contemporary for Oct. 31, before Major Pringle had time to report, it was stated: "*Owing largely to the presence of gas on the train, several persons were burned to death.*" Now "in the light of cooler judgment, and subsequent experience," prompted and provided by the part of Major Pringle's report that deals directly with the Aisgill disaster, our contemporary states: "The Inspector considers that there were two sources of fire—burning gas and live cinders from the ash-pan—*the first of which was successfully coped with.*" Our contemporary might have said much more on this point had it chosen, but what it has said is perhaps as much as one can expect from it. If our recollection serves us rightly, the same paper formerly argued strenuously as to the impossibility of live cinders having caused the fire. As we to-day ponder over its tirades in connection with this subject, we are impelled to the belief that there is "value in the sense of proportion." To possess it, would certainly save some electrical people from a lot of foolishness.

A Sense of Proportion.

Turning to "Meteor" of the "Electrical Times," he seems to think that fair play is satisfied regarding the Inspector's report on the part that gas did not play in the Aisgill fire by saying:

Meteor's Cricket.

"After stating definitely that a quantity of gas escaping from the cylinders ignited immediately after the *explosion*," the Inspector remarks. [Here follows one of the recommendations of Major Pringle that gas should be for railway carriage lighting superseded by electricity.] Will "Meteor" kindly point out where that sentence appears with the word "explosion" in it? We will leave our electrical readers to say whether his statement constitutes a fair disposal of the matter in relation to Aisgill. It is not the first time that we have had occasion to question his fairness where gas is concerned. There are several matters within memory where this has happened. Only the other week, he drew prominent attention to a singular statement from the "Lancet." He has not, however, found an opportunity to draw similar attention to our criticism of the "Lancet" statements, and to give a few actual figures, which incidentally would have revealed his own want of knowledge of a matter which he was so willing to support—because it suited him. Major Pringle's report is dealt with in our editorial columns, so that further reference here is unnecessary.

Cooking Troubles.

Sincere is the sympathy with our electrical friends over the double-face they have to maintain in regard to the cooking business. "All's well," they say publicly; what they and the users of the appliances say privately is another matter. But they must know that bluff cannot be maintained for ever, and that experience is having, and will continue to have, a healthy effect in putting bluff out of countenance. It is found that new users of electric cooking ovens are more and more difficult to obtain, and this is due to the circulation of experience—not only with ovens but with smaller devices that are also classed as "cooking" appliances to make the number swell. Much the same sort of thing is happening with electric heating. Gas supply authorities know it well. The fact cannot be concealed from them when gas-stoves are being reconnected, or gas bills resume their former size. The other day one platform electric cooking advocate and demonstrator with shavings of bacon and pale-faced tartlets stated that there were "in use" 10,000 electric-ovens of one particular type. There may have been 10,000 pieces of goods sold by that intelligent representative's firm; but if they have not sold more than 10,000 ovens, then we can vouch that the whole of the 10,000 are not "in use." There are a few gas companies who could supplement our own information.

A Delicate Subject.

A writer on the staff of the "Electrician" says the present position of the cooking and heating business is, "quite naturally a delicate one." We fully believe him; and the words "quite naturally" have a peculiar appositeness both in fact and in the construction of the sentence. The electricians in this cooking business are ever trying to apply to purposes for which it is unsuitable, economically and reliably, a method of heating that is physically unfitted to seriously compete with direct methods which do not suffer the same disadvantage of being offspring of a process prodigal in its squandering of heat units. For the uncomfortable experiences from which they are suffering, electrical engineers blame the manufacturers of the goods; and the "Electrician" sides with the engineers in this matter. In fact, it speaks as though the manufacturers are to blame for all the disabilities that electricity suffers in this matter, quite apart from the fact that the poor manufacturers are harassed almost out of their lives for cheaper and cheaper goods. If the critics of the manufacturers would only sit down and get out a detailed statement of the parts of an electric-cooker suitable for service in a domestic kitchen, where it will not be subjected to a silk gloved tenderness, together with metal and production costs, a margin for establishment charges, and a meed of profit, they will learn something that will assist in toning-down their criticisms of the manufacturers. It is obvious that the "Electrician" has been prompted by some sad experience to make the attack on the manufacturers that it has done. We agree that it is a serious matter for an engineer to persuade (say) a local hotel proprietor or restaurateur to throw out his dependable coal or gas cooking plant, and to instal electric-cookers in their place. If an hotel proprietor or restaurateur is foolish enough to throw out an alternative cooking equipment, and then finds himself let down by one which is subject to trouble from the generating-station right up to the point of the heating-elements, then he has only himself to thank for having been so lamentably pliant in the hands of the electrical engineer or canvasser. When the apparatus is delivered, our friend says "it should at least be reliable in such details as element terminals, switches, door fitments, and the like." Just so. Electric-cookers may be absolutely perfect in these matters when delivered, but they may not remain so long. And, again, "adequate, not to say intelligent, fusing should also be a feature of the apparatus." For the second time we say, "Just so." The users of some electric-cookers have found that there is a form of fusing that they do not regard as either "adequate" or "intelligent;" and they will not forgive nor forget, nor make any allowance, even if they should read Mr. Duddell on "Pressure Rises" and their effects. "Failures, when they do occur, always happen when they cause the greatest amount of inconvenience; and in the case of a restaurant or hotel, every moment of failure heavily penalizes the management." For the third time we repeat, "Just so." And now perhaps our good friend will tell us the location of the terrible experience that has caused him to write with so much spikiness against the hard-pressed manufacturers of electric-cookers. Perhaps he will not.

Cooker Guarantees.

While our journalistic friend slates the manufacturers one week, a fortnight before he was cautioning them against being so absurd as to give long cooker guarantees as a sale sop. He found there was a tendency for the cooker manufacturers to run riot in the matter of the guarantees they were prepared to offer for the purpose of inducing purchase; and he told them as plainly as he could that this was a very stupid thing to do, for the simple reason that they know heating elements and other things will not last a long guaranteed period. If the vital parts of an electric cooker under normal kitchen use last for five years, that should qualify them to permanent place in one of our national museums. Some manufacturers speak of five years' guarantee, but not very many. Others talk of two years as the period within which they are prepared to replace faulty heating elements, and some suggest twelve months. Our friend urges that the manufacturers should endeavour to come to some uniform guarantee period, and not try to outdo each other for advertising purposes by adopting guarantee periods that have no consonance with the useful lives of certain of the elements—heating or otherwise—of the cooker structure. He seems to think that one year would satisfy ordinary requirements for a guarantee, and that makers should aim at this. In view of this, what puzzles us is why a fortnight later he should have been so nasty towards the manufacturers. One week he admits the inevitable in the matter of short life; a fortnight later manufacturers of these inevitably short-lived articles must be jumped upon. There is a want of consistency here.

Electricity and Ventilation.

The Council of the Institution of Electrical Engineers do not appear at all particular about correcting the bad atmospherical conditions of their lecture hall. Quite a long time since, the "Electrical Times" applied the whip to the Institution authorities on the subject of the illustration that the hall—an electrically lighted and "ventilated" one—afforded of the enervating effects of stagnant air. But there does not appear to have been any real betterment. The "Electrician" has a turn now. The hall was crowded on a recent evening when Mr. W. Duddell, F.R.S., delivered a lecture on "Pressure Rises." Our contemporary writes: "To follow a lecture with the closeness which the subject last Thursday deserved, it is necessary that the audience should be comfortable. The ventilation of the hall made this difficult, and gave rise to the wonder whether if gas, with its supposed [a slip of the pen—'real' is evidently the word intended] virtues had been used for lighting, the air would have been any fresher. Perhaps some gas expert will tell us." There is a note of interrogation after the "us" in the original; why is not clear. There is not the slightest question that if (say) a couple of multiple burner ventilating gas-lamps were installed in the Electricals' lecture theatre—lamps similar to the one in the hall of the Society of Arts—that a marked difference in the atmospheric conditions would be the result. We suggest that the Institution should give the Gaslight and Coke Company an opportunity of showing the Council and members how to deal with the atmospheric stagnation that exists in the hall when members crowd its benches.

From Gas-Works to Generating Station.

The "Electrical Times" appears to have dedicated part of its body and soul to bringing about a closer co-operation between the gas-works and the central electricity generating station. It is an object for which it will doubtless receive due reward in the time to come. The idea of using coal in a manner that will only give a heat efficiency of about 15 per cent., and uselessly dissipate about 80 per cent., is altogether repugnant to its idea of the proper conservation of the earth's treasures and the advance of the world's economy. So it is championing the cause of the younger industry taking advantage in its generating stations of the gas resulting from the more civilized treatment of coal in gas-works retorts or in coke-ovens, whereby so much that is valuable is saved, and is not allowed to pollute, *viâ* the electricity station chimney, the atmosphere with carbon, sulphur dioxide, carbon monoxide, and all sorts of undesirable products. There are two things that have specially revived this subject in the mind of our contemporary. Mr. W. B. Woodhouse, in his recent Presidential Address to the Leeds Local Section of the Institution of Electrical Engineers, has told how the Yorkshire Power Company have effected a junction with the old Silkstone Collieries coke-ovens; and by the surplus gas, they are now producing some 2000 kilowatts of power continuously. The other occurrence that prompts our contemporary is that Mond ammonia-recovery gas-plant has been so successful at the Accrington electricity station, that extension of it is being made—the gas plant being doubled, and two more gas-engine sets are on the way. It is all working out very profitably. The following paragraph from a descriptive article is worth reproducing:

> The fuel consumption per kelvin generated averages about 1½ lbs.; and it should be pointed out that this is the actual figure obtained during a typical week's run—it is not a mere test result. With bituminous fuel at 13s. 6d. a ton, this corresponds to 0·108d. per kelvin. Mr. Gray tells us that the total works' costs, after crediting sulphate and tar, and after debiting steam used and everything else by way of

labour and material, are from 0·18d. to 0·19d. per kelvin. His gas sets alone are turning out 120,000 to 130,000 units a week; and the maximum load on the engines is about 1360 kilowatts. The sulphate of ammonia sells at £12 10s. per ton; and it would pay to produce it at anything over £6. The tar, containing some water, goes at 10s. a ton.

It would not pay all electricity generating-stations to put down gas plant of their own; so that the time may come when there will be some further subterranean connections between town-gas works and electricity stations. Meantime, it is rather noticeable that there is not such frequent reference as formerly to new contracts for Diesel engines for electricity generating stations. The oil market has given their adoption a very ugly shock.

HIGH-PRESSURE GAS LIGHTING IN THE NEW CITY PASSENGER SUBWAY.

As we go to press, we have to chronicle the opening of the new city passenger subway at the junction of Cannon Street and Queen Victoria Street (the third of its kind in the City) by the Lord Mayor (Sir T. Vansittart Bowater) and Sheriffs.

The idea of a subway at this spot originated with Deputy A. C Morton, M.P. (ex-Chairman of the Streets Committee), who, in November, 1909, directed the attention of the Court of Common Council to the desirability of constructing a subway for pedestrians at this spot, in connection with the Mansion House Station of the District Railway. The question was referred to the Streets Committee for consideration and report. Having regard to the acceleration of traffic generally—24,000 vehicles passing the site in twelve hours daily—and to the increase of motor vehicles, the necessity for subway communication was so obvious that the Streets Committee, after consultation with the City Police (cordially supported by the Chief Commissioner in the interest of the public), unanimously agreed to recommend the Corporation to proceed with the work. The further increase of fast motor traffic made the proposal imperative, and powers were eventually obtained in the City of London (Various Powers) Act, 1912. Plans and specifications were prepared by Mr. Basil Mott, M.Inst.C.E.; and the tender of Messrs. Mitchell Bros., Limited, was accepted on Oct. 31, 1912. The work was carried out by the Streets Committee, under the supervision of a Sub-Committee, which included the Chairman (Mr. Gordon Stanham).

The subway runs approximately from east to west, and from north to south. The southern entrance has been arranged so as to give direct access to the booking-hall of the Mansion House Station, as well as to the street—the Railway Company providing the necessary space and frontage. Considerable difficulty has been experienced in carrying out the work, owing to the small space available, and to the presence of large numbers of telephone cables, and gas, water, and electric mains. The London County Council pipe subway, which runs under the foot-passenger subway, with the many mains therein—including the 36-inch high-pressure gas-mains from Beckton—has had to be lowered, and the sewers diverted. The cost will be about £16,000.

The subway will be lighted throughout by means of high-pressure gas, at 90 inches, taken from the newly-laid main connected to the Gaslight and Coke Company's power station at London Bridge. It will be joined up to the high-pressure system at Horseferry Road, when the 6-inch main now being laid in the Queen Victoria Street subway is completed, so that the main will have pressure driving engines at each end. At present there are 18 high-pressure lamps installed, to be followed by others when the subways are completed. The lamps in use are Keith's latest pattern miniature "arcs"—two of 200-candle power each at the intersection of the subways, and 16 of 100 candle power each fitted along the centre line of the subway roof. The average distance apart is about 15 feet. The service-pipe runs along the top of the walls on either side of the subway, with the Keith control cocks at the service ends carrying the gas to alternate lamps, as half the lamps will be turned out in the daytime. A private view of the new lighting shows it to be extremely effective; the white glazed bricks of the subway walls adding to the reflective power of the lamps. The lighting will be further extended when the northern arm of the subway is completed. The direction signs over the staircase entrance are also proposed to be lighted from the same source.

Among the visitors invited to the opening ceremony was Mr. F. W. Goodenough, the Controller of the Sales of Gas Department of the Gaslight and Coke Company, under whose direction the lighting has been carried out.

Changes in the Engineering Staff of the Gaslight and Coke Company.—We learn from Mr. H. Rayner, the Secretary of the Gaslight and Coke Company, that, consequent upon the resignation of Mr. J. N. Reeson as Resident Engineer of the Company's Beckton Station, on being appointed Engineer of the Melbourne Gas Company, the following appointments have been made to the engineering staff: Mr. T. S. Lacey is to be Resident Engineer at Beckton; Mr. C. A. Cunnold will be Resident Engineer at Nine Elms, in the place of Mr. Lacey; and Mr. J. H. Methven will hold a similar position at Kensal Green, in succession to Mr. Cunnold.

WORKS TOPICS—IX.

By Modus Operandi.

The meeting of the Southern District Association of Gas Engineers and Managers should give a fillip to the adoption of motor haulage for the business of gas undertakings. So far as gas-works are concerned, the President in the discussion showed plainly the full significance of the effect, in certain cases, of changing from horse to motor haulage. His remarks apply chiefly to those undertakings that have two or more manufacturing stations; for in such cases, by using the most convenient station for the delivery of coal, it is possible to transport a portion of it to the other stations at very low cost. By such means some of the advantages of concentrating works are nullified. The two works Wandsworth and Mitcham are a case in point. The former is as well, as the latter is badly, placed for receiving coal; for, as Mr. Carr points out, under the old conditions the Wandsworth works held an advantage over Mitcham to the extent of 4s. per ton of coal. But, by conveying coal from one works to the other by steam waggons, the difference in this respect has been reduced from 4s. to 6d. per ton. Such a saving is simply astounding. There are no doubt other works in which a steam waggon could be introduced with beneficial results, and it behoves engineers to look closely into this matter.

Comparing Costs.

As is usual, when comparing costs the speakers differed in their methods of giving figures. Some appear to have omitted one thing and some another. Mr. Woodall, who read the paper, only included labour, fuel, and stores. The last item is rather an elastic term, and might be taken to include tyres and the renewal of parts. This, however, was not so. But at the same time, reading over the discussion it is by no means clear what was and what was not included in the figures given in several instances. It should be a safe rule in all such cases to include interest, depreciation (stating the rate), wear and tear, labour, fuel, and stores. The whole tale would then be told. Especially in the matter of petrol-driven motors, the question of depreciation is all important. If this is ignored, a totally wrong impression is given. The policy of the South Metropolitan Company, as explained by Mr. W. Doig Gibb, of charging sufficient depreciation to pay off the loss in seven years, shows a true recognition of the necessity of including this item in all cases.

For the carriage of coke from works to customer, Mr. Thomas Glover made it clear that there is a considerable saving in using a steam waggon for the purpose. He stated that, in delivering coke to a distance of 11 miles, a four-ton steam waggon would do the journey for 2·5d. per ton-mile, as compared with 8·73d. per ton-mile with horse cartage. The saving in this case again is enormous.

Choice of Waggon.

In choosing waggons, gas engineers should, wherever possible, adopt steam in place of petrol driven vehicles. The fuel in the case of the former is coke, and this being so, there are special advantages which should not be overlooked. It is obviously good business to use your own bye-product, especially if it will do the work at less than half the cost of petrol, as is the case with coke used in steam waggons. Again, as Mr. Glover pointed out, repairs to steam-engines are readily undertaken by the works mechanics, who would not in the ordinary way have sufficient experience to deal with petrol engines. Thirdly, there is an uncertainty about the price of petrol—not overlooking taxation—which is totally absent in the case of coke. Finally, in the matter of depreciation, a considerably longer life can be counted upon in the case of steam waggons. If a depreciation of 14 per cent. is sufficient with petrol motors, one of 8 per cent. should be enough for steam-engines.

Purification Questions.

Much else of interest was forthcoming at this meeting, but it referred almost entirely to works of a medium or large size. Now that oxide of iron is so universally used, it is by no means rare for each purifier to last twelve months and over from the time it is put to work until it is again discharged. This being so, little scope exists in small works for the installation of either of the useful machines described by Mr. Woodall. If, however, such a machine as an oxide crusher could be purchased for something under £50, including engine and shafting—which is extremely unlikely—quite a large field would be opened up. In larger works the use of such machines as were described is justified from every point of view, and not least on the score of the efficiency with which such work can be done mechanically.

As regards the rapid revivification of oxide to which Mr. Woodall refers, it is common knowledge among those who have adopted the backward rotation system that oxide can be broken-up, watered, and re-charged in an efficient condition, within 24 hours, into the same purifier from which it was discharged. The reason of this is that it is practically revivified *in situ* before being discharged. To ensure this being so, it is necessary to place the vessel last in the series for at least a week or ten days before its discharge. In such a position the oxygen present in the clean gas will do the work of revivification slowly and well, and prevent any possibility of the oxide firing either inside or outside the purifier. By the same means the discharging of the oxide is rendered quite free from objection on any score.

Space forbids any discussion of the other subject—breeze

washing—introduced by Mr. Woodall; but this question will be dealt with at an early date. The same must be said of Mr. Harris's interesting paper on "The Extraction of Tar from Water-Gas."

GAS LIGHTING OF RAILWAY CARRIAGES.

Extracts from Major Pringle's Report on the Aisgill Accident.

THE report of Major J. W. Pringle, R.E., on the fatal collision that occurred between two passenger trains near Aisgill, on the Midland Railway, on the 2nd of September last, was issued last Tuesday. The disaster was referred to in the "JOURNAL" at the time. It will doubtless be remembered that two South-bound express passenger trains were concerned in the case. The first comprised vehicles from Stranraer and Glasgow; the second from Aberdeen, Inverness, and Edinburgh. The second train overtook the first, which was at a standstill on the up-road, and a collision ensued. The engine of the second express crashed through the last vehicle of the standing train, and buried itself midway in the passenger coach in front of the van. The roof of the wrecked van, under which the engine passed, cut through the three passenger compartments of the composite carriage which travelled behind the engine of the second train. Fire broke out shortly, if not immediately, after the collision, and the last three vehicles of the first train were burnt. Fourteen passengers lost their lives in the collision—their bodies being wholly or largely destroyed by fire; and two more subsequently died from the effects. The portion of the report which is of special interest to "JOURNAL" readers is that in which Major Pringle deals with the origin and outbreak of the fire; and he acknowledges that this is one of the most difficult points to determine in the case—the evidence bearing upon it being very conflicting. But, after studying the statements made by both passengers and railway men, and allowing for their different points of view—some being on the east and others on the west side of the track—and for apparent discrepancies due to varying estimates of the lapse of time, certain facts emerge which appear to him to be reliable. These may be epitomized as follows.

The collision was followed by a big flash—"a huge flare." He gathered this from the accounts given by a guard, one of the occupants of the front compartment of the wrecked coach. The gas-lamps in this coach were extinguished simultaneously with the collision, and an illumination in the immediate vicinity of the vehicle would be certainly more noticeable to one in darkness than it would be to other passengers who occupied places in carriages farther away, where the lights were not extinguished by the collision. It was only in the two rear vehicles that the lights were put out by the collision. Other witnesses saw red ash and burning cinders fly from the second engine when it struck the first express; and the driver (Caudle) agreed that it was probable there was a discharge from the ashpan, as the damper was up when the collision took place. Subsequently, as other persons arrived on the immediate scene of the wreckage, from two to ten minutes after the shock, fires were observed. Caudle spoke of splintered woodwork smouldering in several places, and a small flame like gas burning in front of where his engine stood buried in the wreckage. Another witness spoke of a gas-jet, the flame of which was striking the floor of the carriage.

Major Pringle says the witnesses were clearly divided in their views upon the origin of the fire. The railwaymen were practically unanimous that no gas-jets were seen or heard—the driver Caudle alone among them stating that the small flame observed was like gas. They felt certain that the fire was caused by live ash thrown from the engine among the baggage and wreckage, which broke into flame at various points. This opinion is supported by two passengers who alone were on the ground when the collision took place, but viewed the scene from the near side. Five other witnesses were equally positive that gas was the cause. Two ascribed the outbreak of the first fire or fires on or about the floor level to burning gas; while the last three, who saw no flames or jets of gas at the outset, attributed to the same cause the later fire in the roof of the carriage.

On this point of origin, Major Pringle says it is necessary to consider the bearing which the evidence given by Mr. Bain (the Carriage and Waggon Superintendent of the Midland Railway) has upon the question. The five cylinders carried under the floor of the two wrecked vehicles were subjected to experiment after they had been removed from the wreck. The experiments go far towards proving that, if the perforations and apertures described by Mr. Bain were all the immediate result of the collision, in less than three minutes after the second engine had finally come to rest in the wreckage, all the gas remaining in the cylinders must have escaped. All these cylinders must have been knocked away from their fastenings, and the pipe connections severed in the actual collision. The position of the engine after the collision and of three out of the four bogies allows no other conclusion to be drawn. But Major Pringle says it does not follow that the severance of the pipes between the cylinders and the reducing chambers must have all occurred at that moment. Further breakages of the piping may have resulted while the *débris* was being removed by the breakdown gang. If this were the case, gas might, he says, have been issuing at low pressure for a much longer period than three minutes. He then proceeds:

> There was, from all accounts, a distinct and considerable interval of time between the quenching of the first flames observed and the second outbreak. A continuous escape of gas would, therefore, it appears to me, have been noticeable to the sense of smell; and not one of the witnesses remembers to have smelt gas. Moreover, gas could never at any time have been burning above the floor level, for all the gas-pipe connections above floor level were severed at the moment of collision. The opinion I have formed on this point of origin is that a quantity of gas escaping from the cylinders did ignite immediately after the collision. It is, I think, quite possible that this flash of gas, which possibly lasted some seconds, set fire to some of the surrounding inflammable material. . . . It is possible also that gas-jets may have been set alight under the floor. But if this gas issued direct from the cylinders, the supply must have been exhausted long before ten minutes had elapsed, and before any passengers could have observed it burning.
>
> The fires ignited by gas flashing or burning were extinguished in the manner described by witnesses. A more serious, but less noticeable, source of fire existed, I think, in the live ash thrown from the engine among the baggage and splinters of wood which were piled and massed in confusion in front of the engine as it drove into the passenger coach. This live fire, I think, smouldered, perhaps hidden from sight, and gradually attained strength among the wreckage round and below the smoke-box of the engine, where the temperature must have been very considerable, until, reaching the roof, it burst into violent flames. The wooden roof, which rested on the chimney of the engine, must have been ready to take fire with small provocation.
>
> I conclude that the more serious outbreak of fire arose, not so much from the ignition of gas, which I think caused the first visible appearance of fire, but from the contents of the ashpan, and the heat radiated from the engine, which was buried, practically, in the wreckage.

Major Pringle then proceeds to discuss the relative merits of gas and electricity as illuminants for railway carriages. At the outset, he says "the case for gas as a standard illuminant is not bettered by the circumstances attending this accident. Gas escaped from the cylinders under two of the wrecked carriages and ignited." In an appendix to his report he gives a statement of all the accidents inquired into by the Board of Trade during the past fifteen years in which the wreckage caught fire. There were altogether thirteen cases. Three had been attributed to electrical disturbance; and of the ten remaining, fire was attributed solely to the engine in two, to gas in six, and to both gas and engine causes in two. Major Pringle says: "It will be difficult to deny from this evidence that, so far as danger from fire is concerned, gas is less desirable as an illuminant than electricity."

In his summary, Major Pringle strongly urges upon railway companies the desirability of employing electricity as their standard illuminant. He admits that it cannot be expected that all the gas-lighted vehicles can be replaced at once, as the expense would be too considerable. But the policy of constructing all new stock with electric lighting, and of replacing as early as possible the existing gas-lighted stock on all main line and express services, is, he says, "in consonance with the trend of general practice all over the world, and one which is not impracticable from the point of view of expense."

In concluding his report, Major Pringle refers to the action taken by the Midland Railway Company subsequent to the accident at Hawes Junction, as set forth in Sir Guy Granet's statement. He says he has had personal experience of the thorough manner in which they have dealt, and are dealing, with the two main points brought to light by that accident—viz., the introduction of safeguards to prevent mistakes by signalmen, and of devices to remind them of trains standing out of sight of, or at a distance from, their posts. They have also met very adequately the recommendations in that report, which may be described as of secondary importance, regarding tools and fire appliances, &c. He acknowledges that, after full consideration, they have not accepted electric light as their standard illuminant upon trains; but, on the other hand, they have fully adopted the alternative procedure suggested to safeguard the use of gas. "The design of the cylinders has been altered, the ends strengthened, they are better housed and protected, and an automatic valve has been devised to cut off the issue of gas under high pressure." Major Pringle says these improvements have been applied to new coaching stock, 125 having been so equipped; and 62 old stock have been fitted with the new automatic valve and other improvements.

THE LAST GAS EXAMINATIONS.

Report of the City and Guilds of London Institute.

WE have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) the report on the work of the department during last session. We extract some particulars as to the general work and the examinations in "Gas Engineering" and "Gas Supply."

As showing the extent of the work of the department, it may be mentioned that at the recent general examination in technology 21,878 candidates were presented from 448 centres in the United Kingdom; and 13,618 of them passed. By including the candidates from India, from the Overseas Dominions, and from other parts of the British Empire, those for the special examinations in magnetism, electricity, cookery, and needlework, and those for the teachers' certificates in manual training and domestic subjects, the total number of examinees was 25,339. As readers may remember, in order to secure the expert advice of trade societies and professional bodies in the conduct of the department's educational

work, the Institute have arranged for the formation of several Advisory Committees, consisting of persons interested in, and having full knowledge of, the technical details of various trades and industries. The Council of the Institution of Gas Engineers act as an Advisory Committee in the subjects of "Gas Engineering" and "Gas Supply and Gas-Fitters' Work," in which subjects, on the advice of the Institution, a new syllabus of instruction and examination is in course of preparation. By the aid of these Committees, the Institute are enabled to promote useful relations between trade organizations and the schools in which artizans and others receive their technical instruction.

Coming to the general work of the department, we find that the number of subjects in which examinations were held last session was 74—one less than before; but the number of separate classes increased from 4552 to 4859, and the number of students in attendance from 53,999 to 54,510—the largest on record. While the total number of students in attendance shows an increase, the number of candidates who entered for examination is slightly less than before; being 21,870 compared with 22,111, or a decrease of a little more than 1 per cent. In the subjects of "Gas Engineering" and "Gas Supply," the number of students rose from 802 to 1042, and that of the candidates from 667 to 816, chiefly through the increase under the heading of "Gas Supply."

Turning to the tables which give the results in the separate subjects, the report shows that in the two relating to gas there were 26 centres, with (as already mentioned) 1042 students in attendance. The candidates numbered 278 in "Gas Engineering," and 538 in "Gas Supply," compared with 260 and 407 before. In the Final Grade in the former subject, 32 passed in the first class, 32 in the second class, and 40 failed; while in the grade next below the passes were 64 and 65 respectively, and the failures 45. Thus there were 193 passes and 85 failures, or 30·5 per cent. In the Final Grade in "Gas Supply," 58 candidates passed in the first class, 52 in the second, and 31 failed; while in Grade I. 185 passed in the first class, 128 in the second, and 84 failed. There were thus 423 passes and 115 failures, or 21·3 per cent.

Of the total number of students in the two subjects, one passed at the Battersea Polytechnic in "Gas Supply," in the Final Grade. At the Goldsmiths' College, out of 20 students in attendance, 7 were examined and passed in this subject—2 in the Final Grade, and 5 in the one next below. From the classes at the Regent Street Polytechnic, 35 students out of 53 were examined in "Gas Engineering," and 27 passed—12 in the Final Grade, and 15 in the grade next below it. One candidate was a prize winner. From the various schools of the London County Council, out of 343 students in attendance at classes for the two subjects, 152 were examined in "Gas Supply," and 120 passed—36 in the Final Grade, and 84 in Grade I., and two were prize winners. In "Gas Engineering," seven were examined, and six passed—three in the Final Grade and three in the one next below. At the Woolwich Polytechnic, one candidate was examined in each subject, and passed in the Final Grade.

Reporting on the work of the students in "Gas Engineering," the Examiner (Mr. Thomas Glover) says:

> The quality of the work done in the Grade I. Examination was well above the average of past years. Some excellent sketches and drawings were produced; and some of the answers given revealed a high order of intelligence and power of observation. The same cannot be said, unfortunately, of much of the work done by the candidates for the Final Examination. The sketches were in many cases of poor quality, and indicated that sufficient attention is not being given to the preparatory study of mechanical engineering, which should precede the specialized study of "Gas Engineering."
>
> A comparatively small proportion of students worked out correctly the speed of the projector belt of a De Brouwer machine. A smaller proportion understood the design of a Mond gas plant and the method of producing gas and recovering bye-products by the use of this form of plant. A number of students confused Mondgas with carburetted water gas. The details of manufacturing costs asked for in question No. 5 of the Final Examination were given correctly in only a few instances. On the other hand, the answers to the question on the subject of washing gas with oils derived from coal tar revealed an unexpected amount of knowledge of this subject; and it was gratifying to observe that the lectures given during the year on the subject of carbonization in vertical retorts, as reported in the Technical Press, had been intelligently followed, and good answers were given to the question on this subject.
>
> Speaking generally, it may be said that the quality of the answers to the examination questions leaves the impression that the chemistry of gas manufacture is well taught, but that there is room for improvement in the methods adopted for preparing students for an understanding of engineering questions. Teachers of classes would do well to insist that promising students should make copies of good drawings, and sketch correctly the details of gas-works plant and machinery. The co-operation of gas engineers (both professional and contracting) should be enlisted wherever possible.

Mr. Walter Hole, the Examiner in "Gas Supply," reports as follows:

> There are several features of the examination of a very gratifying character, the first of which is the very considerable increase in the number of candidates. The results are also remarkable for the large number of candidates who have obtained first-class passes. In considering the fairly large number of failures, it is worthy of note that these include a higher proportion than usual of those who have done excellent work in their answers to the two, three, or four questions attempted, but who have not attempted a sufficient number to earn the necessary minimum number of marks for a pass. It seems almost incredible that students who obtained very high marks in three or four questions could not have attempted others on the list with fair prospect of success. However that may be, the general results speak well for the preparatory work done by the students, and the excellence of the tuition given. It may be added, in passing, that the answers in a large number of cases bore welcome evidence of careful perusal of recent papers and discussions reported in the Technical Press.
>
> Another noteworthy feature has been not only the firm grip of first principles, but a power of independent reasoning and application of these principles to new conditions on the part of the students. The papers frequently contained such expressions as "I have never had this to do, but if I had I should proceed as follows, my reasons being;" or, "I am not very familiar with this form of apparatus, but the details of construction and working are evidently." This was exactly what the questions were framed to elicit.
>
> The principal weaknesses shown have been in chemistry and calculations. Many of the candidates attempting Question 5 in Grade I. were hopelessly at sea in such an elementary matter as the proportion of air required for the complete combustion of a 15-candle power coal gas, and the difference between primary and secondary air supplies in a bunsen burner. In Question 1 (*b*) of the same grade, quite a large number worked out the full cost of joints for 9 feet and 12 feet lengths respectively; thus involving themselves in masses of figures which might easily have been avoided. A simple deduction of the numbers in one case from those of the other, and a calculation of the cost of the difference would have solved the problem. In view of this and also almost similar experiences in answers to Questions 1, 7, and 9 in the Final Examination, it would seem that teachers would do well to give students a certain amount of training in the simple arithmetical calculations likely to be necessary, or that students should be required to possess a certain knowledge of elementary mathematics before being sent forward for the examination.

The questions set in "Gas Engineering" were given in the "JOURNAL" for April 22 (p. 270), and those in "Gas Supply" in the next issue (p. 344). The following is the question referred to by Mr. Glover:

5. Assuming that coal costs 12s. per ton delivered into store at a gas-works, and that 75 per cent. of the cost was recovered by the sale of bye-products, what would be the approximate cost per 1000 cubic feet of gas into the holder? Show details of how the cost is made up.

The questions specially mentioned by Mr. Hole were:

Grade I.

5. How is a non-luminous flame produced from coal gas? How many volumes of air to one volume of gas are required for the complete combustion of a 15-candle power unmixed (no carburetted water gas) coal gas? About what proportion of air is introduced as a primary air supply in an upright "C" burner, and what is the effect of (*a*) an under-aëration, (*b*) an over-aëration of the flame?

1. (*b*) It is proposed to lay 1000 yards of 6-inch cast-iron main. Calculate the saving effected by using pipes 12 feet long as compared with pipes 9 feet long, assuming (1) that it costs 1s. 6d. to make a 6-inch joint, (2) that a 6-inch socket weighs 28 lbs., (3) that the cost of the pipes is £5 7s. 6d. per ton.

Final Grade.

1. Transpose Dr. Pole's formula—

$$V = 1350\, d^2 \sqrt{\frac{p\, d}{s\, l}}$$

into terms of d. You are required to supply a factory with 3000 cubic feet of gas per hour through a service 100 yards long. The pressure at the inlet of the meter is to be not less than 30·10ths, and the pressure in the main from which the service is to be taken is 32·10ths. Calculate the size of service required. (Specific gravity of the gas = ·4; and $3^5 = 243$, $4^5 = 1024$, $5^5 = 3125$.)

7. State exactly how you would test a gas-heated water-boiler for thermal efficiency. Assuming that it took 45 cubic feet of gas having a calorific value of 550 B.Th.U. to raise 36 gallons of water from 50° Fahr. to 110° Fahr., what would be the percentage efficiency?

9. With gas at 2s. per 1000 cubic feet, and electricity at 3d. per unit, calculate the cost of gas and electricity respectively of (*a*) 100 high-pressure gas-lamps, (*b*) 100 metallic filament cluster lamps, and (*c*) 100 flame arc lamps, each of the lamps being of 1000-candle power, and running for 1000 hours. (The 100 metallic filament cluster lamps are to be made up of five 200-candle power lamps in each cluster.)

The names of the successful candidates in both subjects will be found in the "JOURNAL" for July 8 (p. 106); and those of the prize winners on Aug. 5 (p. 360) and Sept. 16 (p. 750).

Masonic.

The regular meeting of the Evening Star Lodge No. 1719 was held at the Freemasons' Hall, Great Queen Street, last Wednesday, when, after the ordinary business had been transacted, the election of W.M. and Treasurer for the year 1914 took place. For the former office, W. Bro. E. G. Smithard, of King's Lynn, was selected; and for the latter office, W. Bro. Arthur Valon. Arrangements were announced for a "Ladies' Night" in connection with the Lodge and Chapter, to be held at the "Connaught Rooms" on Friday, Jan. 23.

New Verticals at Nottingham.—The official inauguration of the new works at the Radford gas depôt of the Nottingham Corporation, which was postponed a few weeks since, has now been fixed for the 11th inst., when the programme as originally arranged will be carried out. An inspection of the recently installed Glover-West vertical retorts will be followed by luncheon at the Exchange Hall; the Gas Committee having invited the attendance upon the occasion of their colleagues on the Corporation.

POINTS IN THE GAS-FIRE CONTROVERSY.

[Communicated by the Technical Department of the Davis Gas-Stove Company, Limited.]

It is with great interest that we have noted the communications which have recently appeared in the "Journal" bearing upon the all-important subject of gas-fire construction, and the relationship between constructional details and thermal and hygienic efficiency.

Mr. Hartley's Lecture.

The first of the publications to attract attention was Mr. Harold Hartley's lecture before the Yorkshire Junior Gas Association, and reported in the "Journal" for Nov. 11. Before offering any criticism or observations on the subject-matter of the lecture, we should like to congratulate Mr. Hartley upon the masterful way in which he deals with the subject, and to thank him for the very interesting and useful communication for which he made himself responsible.

We have been greatly interested in Mr. Hartley's investigation and criticism of the Leeds method of testing for radiant efficiency, but do not feel disposed at the moment to offer any critical observations on this portion of the lecture. But this early opportunity may be taken of saying that we in every way support the editorial view, and think that a great deal of good would result from a conference between those members of the gas industry whose knowledge and experience justify them in expressing their opinion as to methods of testing gas-fires. In our opinion, a concerted effort in this direction is needed; the best results and highest ideals being only attainable in this way. At the moment, we do not propose to say more about the method of testing; but a few observations will be offered upon the subject later, when dealing with the communications that have been published from Professor Bone and Mr. Yates.

After having dealt with the method of testing, Mr. Hartley adverts at some length to the question of products of combustion and hygienic efficiency, which part of the lecture we find of peculiar interest. We are, however, unable to agree with some of the contentions, and trust that our remarks will be accepted in the spirit in which they are tendered.

The Canopy Question.

Mr. Hartley says that, although the lower edge of the canopy of a gas-fire may be brought down almost to the level of the top of the fuel, it is by no means certain that, for this reason alone, the products of combustion will all pass through the flue-outlet, even though the outlet be of reasonable shape and size. We are of opinion that, in the light of recent knowledge, this would not cause surprise to the members of such a gathering as Mr. Hartley was addressing.

The position of the front edge of the canopy relative to the fuel tops has, within fairly wide limits, little or no bearing upon the capacity of the small chimney formed by the canopy chamber of a gas-fire. It must be common knowledge that there are certain constructions in which the canopy edge is brought right down to the level of the top of the fuel, and in which hygienic efficiency is far from obtained. There are also other constructions in which the canopy edge is very little above the front edge of the fuel, which are hygienically defective.

Fig. 1 illustrates a section of a gas-fire of the first type mentioned. In this case, it will be observed that the flue-outlet is circular, and very small; thus greatly reducing the capacity of the chimney, and rendering it impossible for the products of combustion to escape by the proper course unless assisted by a considerable length of flue-pipe, or by a strong chimney draught. It will be readily observed that the capacity of the chimney in this instance is restricted by the use of quite a small circular flue-outlet.

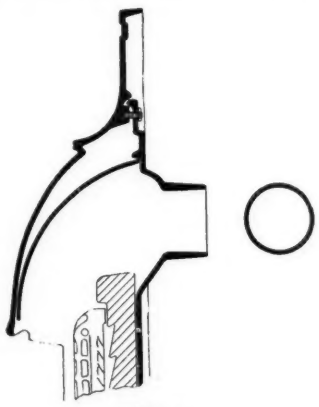
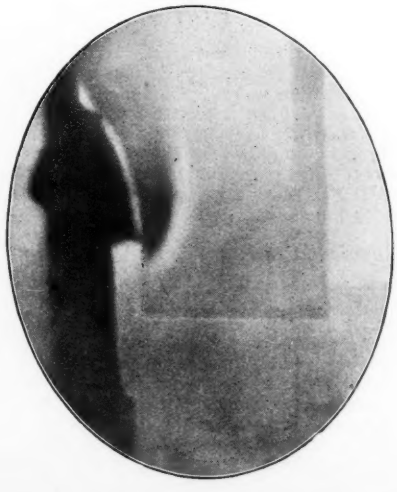


Fig. 1.



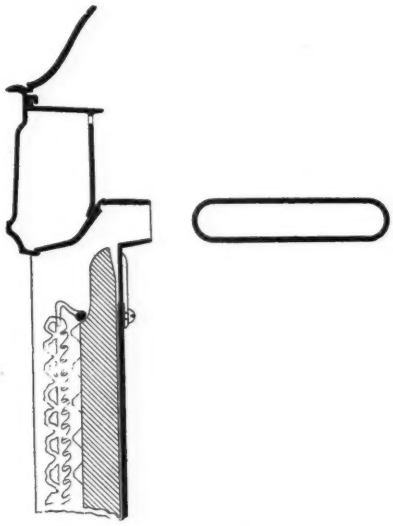


Fig. 2.

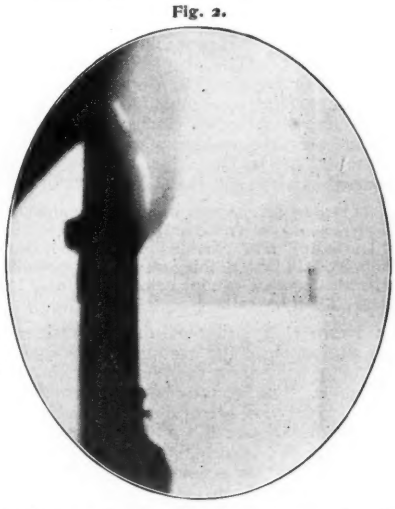


Fig. 2 illustrates a fire in which the canopy edge does not come quite down to the level of the top of the fuels; and in this case it will be observed that the flue-outlet is oval in shape, and of liberal dimensions. It will also be remarked that the flue-outlet is situated very little above the front edge of the canopy, and, on this account, the capacity of the chimney provided by the construction of the fire is not sufficient to satisfactorily deal with the products of combustion.

In conjunction with each of these sketches, we give a photographic record of the result obtained when these fires are tested by the "Shadowgraph" method; the fires being in use without the assistance of any flue-pipe whatever.

This opportunity may be taken of pointing out that we have never asserted that the ability of a gas-fire to satisfactorily pass the whole of its products through its flue-outlet unaided by any form of chimney draught other than that set up by the construction of the fire itself, is in any way dependent upon the bringing down of the front edge of the canopy to, or almost to, the level of the tops of the fuels. We have not made any such claim, because our investigations, carried out some years ago, satisfied us that this was not the case.

Fig. 3 shows a modification of the form of construction which we have standardized, and had in use in recent years. It is identical in every respect, with the exception of the distance

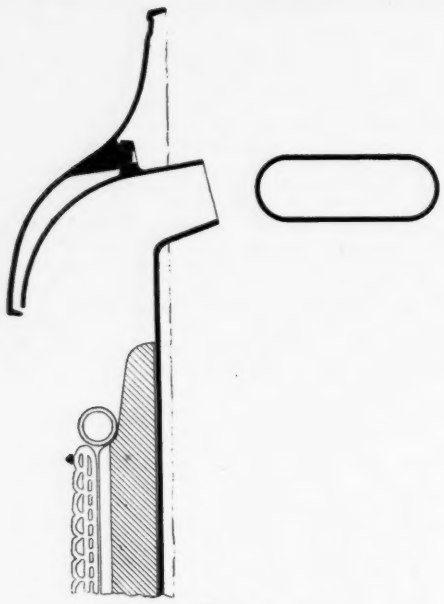


Fig. 3.

between the top of the fuel and the front edge of canopy, which is considerably greater than on the standardized models. We may say, however, that the illustrated construction has actually been built and tested, and has been found to pass the "Shadowgraph" test.

Reading further into Mr. Hartley's lecture, the next point of interest deals with the effect of dead-spaces in the canopy chamber above the flue-outlet of the fire, which we prefer to describe as "pockets." Mr. Hartley goes to some trouble in explaining the detrimental effect of these pockets, and makes up a case which, in our opinion, is sufficient to justify their entire exclusion from gas-fire canopies. We are surprised to find that Mr. Hartley, later on in his address, goes to the trouble of pointing out that a certain construction which passes the "Shadowgraph" test, is not free from these pockets. "It would be absurd to contend that a gas-fire could not be built which would pass the 'Shadowgraph' test, although pockets or dead-spaces above the flue-outlet were found in its construction." The absurdity of such a contention could be illustrated in many conclusive ways; but we cannot too strongly urge the importance of eliminating from the construction of gas-fires this feature which Mr. Hartley has so ably shown to be unscientific, and therefore undesirable.

Later there is another passage in Mr. Hartley's lecture which we must say caused us some surprise. We therefore quote it:

> What I am saying may appear to many of you as rank heresy, as, for many years, one of two doctrines has been preached, the first of which states that, provided your canopy projects well beyond the line of the fuel, nothing else matters, while the other states that, provided your canopy comes down near to the top of the fuel, then all will be well.

We are not aware that either of these doctrines has been preached. The projection of the canopy edge beyond the line of fuel has a certain bearing upon the removal of the products by way of the fuel-outlet. But in our opinion this projection is finally controlled by a careful consideration of conditions which are likely to arise when the fire is fitted and working under practical every-day conditions. A few words more will be said on this subject in a later portion of this article. With the other doctrine, which refers to the relationship between the front edge of the canopy and the top of the fuel, we have already dealt, and think we have now, and at other times, brought forward sufficient evidence to show that this point is relatively speaking of little importance in its effect on the hygienic efficiency of the fire.

We cannot agree with Mr. Hartley when he says that all gas-fires are employed in conjunction with chimneys. This is not so. It is well within our knowledge that many gas-fires are fitted, not only without the aid of a chimney, but several cases have been found where gas-fires are fitted without the aid even of a flue elbow. We are, however, in entire agreement with Mr. Hartley's observations on chimneys and the varying conditions that they are likely to provide. The result of a complete realization of this point has naturally resulted in the setting-up of a hygienic standard, which renders the fire, so far as is possible, independent of variable and unreliable chimneys.

The problem of complying with the conditions of this standard, as Mr. Hartley says, is not a difficult one, now that the importance of various constructional features bearing upon the matter have been laid before the industry in a clear and concise manner. A careful consideration of the points which have been shown to have a distinct and important bearing on the problem, will have made it clear that fulfilment of the condition will not in any way restrict artistic design, or necessitate any sacrifice whatever of heating efficiency.

The Projection and the Ledge.

Mr. Hartley goes on to describe the very interesting results which he has obtained in the use of what he terms "the ledge principle of construction." His observations on this point are of great interest, and there is agreement with him that the projection of the canopy should not fall outside certain maximum and minimum limits. Mr. Hartley, however, appears to prefer a canopy which is constructed closer to the minimum than that which we have adopted. On this point, there is disagreement with him. We think, however, that, in stating that this maximum and minimum distance is determined by the position of the outer layer of the stream of products at the level of the bottom of the canopy, and the vertical distance between that point and the flue-outlet, Mr. Hartley has mentioned two of the vital points. The extreme importance of the vertical distance between the bottom edge of the canopy and the flue-outlet is one upon which we have insisted for many months, and from many platforms. Therefore it is pleasing to have Mr. Hartley's confirmation.

While considering the application of "the ledge principle," it is interesting to note that, in all the illustrations given by Mr. Hartley, the canopy of his fire projects *well* in front of the burner-line, but the ledge returns inwards from the point of maximum projection. Thus Mr. Hartley asserts that it is obviously not necessary that the canopy should project well within the line of the fuel, but illustrates only constructions in which a liberal projection is allowed.

It is regretted that in giving these illustrations, Mr. Hartley has not shown or stated the actual shape and size of the flue-outlet; for, as we have repeatedly asserted, this, in conjunction with the vertical height from the front edge of the canopy to the centre of the flue-outlet, represents the most important point which has to be taken into consideration in building a fire capable of complying with the hygienic standard. It is interesting to note that, in producing a fire which it is claimed passes the "Shadowgraph" test from the time of lighting up, this result is obtained by the elimination of pockets, and by increasing the vertical distance between the front edge of the canopy and the centre of the flue-outlet.

Later Mr. Hartley introduces certain figures bearing upon the relationship between hygienic and radiant efficiency, and the relationship between the position of the front edge of the canopy, and the effect of ventilation upon radiant efficiency. Even putting the worst construction upon the results Mr. Hartley shows, it is seen that the low-canopy fire suffers only a minute loss of radiant efficiency due to the ventilating effect obtained when a strong chimney draught is applied. On the other hand, our results have led us to the conclusion (which has been confirmed by the results obtained by Mr. Butterfield, and recently published) that a certain construction of high-canopy fire suffers an equivalent loss; and we will later, in referring to this particular construction, quote figures published by Professor Bone, which show that its loss is even greater than the low-canopy construction when a reasonable and normal chimney draught is in operation.

The only other point of interest which remains for us to deal with is Mr. Hartley's observations on the possibility of products escaping between the inner and outer canopies of a construction similar to that which our firm have placed upon the market. This matter has already been dealt with in the columns of the "Journal;" and now we would only say that one of the objects of placing the canopy edge well in front of the burner-line is to ensure an upward and forward movement of the *air* at the canopy edge. This means that between the canopy edge and the outer layer of the ascending stream of products of combustion, there will be an upward moving layer of *air*. So that if there is an ascending current between the two canopies, it will be air. On this point, we have carried out repeated tests, and have satisfied ourselves as to the truth of this contention.

Before closing our remarks on Mr. Hartley's lecture, we should like to say that it is very gratifying for us to know that other gas-stove makers are giving these points their careful consideration, as well as to have the confirmatory opinion on so many points by one of Mr. Hartley's qualifications and standing.

Mr. Yates's Lecture.

The next publication to attract attention is Mr. Yates's lecture to the Manchester and District Junior Gas Association, as published in your issue of Nov. 18. The subject of the address was "A Survey of the Gas-Fire Position."

It is not proposed here to review the many changes which have taken place in gas-fires during recent years; but rather to confine our remarks to the observations relating to the most recent developments and present tendencies in gas-fire construction, and the views which the lecturer expresses with reference to testing methods.

Crying a Halt in Radiant Efficiency.

It is rather interesting to note that, with the circulation of the intelligence that a certain maker is claiming previously unheard-of radiant efficiencies, Mr. Yates should wish to call a halt, and to restrict the generation of that form of heat which he has so persistently advocated in its maximum possible proportion. In short, Mr. Yates appears to have taken unnecessary fright, as there has been no claim whatever made for an unduly high percentage of radiant efficiency from the particular construction of fire referred to. It has merely been asserted that the radiant efficiency of this particular fire, as compared with its predecessor,

has been greatly enhanced; but it has not been claimed that it is at present far in excess of anything hitherto realized. It is said that, in comparison with the same makers' fire of 1912, the 1913 pattern shows an increase of 43 per cent., presumably in the number of heat units radiated per hour. This has no distinct relationship to radiant efficiency per cubic foot of gas consumed. From our own tests, we are satisfied that the fire in question gives little if any more radiant efficiency per cubic foot of gas consumed, than the average gas-fire produced by any well-known maker for the present season's trade. Therefore there is no necessity to become scared, as we are not of the opinion that the useful limit of the percentage of heat which should be given off as radiation has been anything like reached. In fact, we believe it is possible to considerably increase the percentage of radiant heat which can be obtained from a properly constructed gas-fire.

Assertion and New Practice.

Mr. Yates goes on to deal at some length with the relationship between the canopy position and radiant losses. Before dealing with this, we should like to point out what appears to us to be the peculiar changes which have come over the position taken up by Mr. Yates and his firm at various times. In the first place, there may be brought to notice the statement for which Messrs. John Wright and Co. were responsible in 1910, in which it was stated that one of nine essential features of a good gas-fire was that none of its products of combustion should escape beneath the canopy; this statement being succeeded by: "We cannot too strongly urge all gas authorities," &c. Later in the same statement it was claimed that this, among other essential features, was provided by the "Thermo X" series of fires produced by Messrs. John Wright and Co. Then on Sept. 3, 1912, Messrs. Wright and Co. were responsible for the following statement, which we think your readers will agree is, if nothing else, a clear and undoubted condemnation of a principle. The statement referred to is as follows: "The fire that carries off all its products of combustion without being attached to a flue will, when ordinary chimney draught comes into play, invariably carry off more than the products of combustion—to wit, an unnecessary number of heat units as well, and a lowered room-heating efficiency is the result." This statement was criticized first by the "Journal," then by ourselves and others, including various independent scientists who have been called in to investigate the matter.

Mr. Butterfield, for instance, has reported upon it; and his last communication appeared in the "Journal" as recently as Nov. 11. The meaning of the statement quoted above has been clearly shown to be that such a gas-fire as is referred to will suffer loss in heating efficiency by reason of the air drawn through the flue outlet for ventilating purposes coming into contact with and cooling the fuel, with the result that its radiating powers will be reduced.

In the "Journal" for May 27, 1913, Mr. Yates gave certain figures which had been reported by Professor Bone as the results of the investigations which he had carried out on behalf of Messrs. John Wright and Company. In this investigation he used a 10-inch "Wizard" gas-fire by Messrs. Wright and Co. and a No. 1 "Vesta" fire of the Davis Gas-Stove Company—testing each, firstly, without any flue pipe or flue attachment of any sort being connected to the fire; and, secondly, in conjunction with a chimney—the height of the chimney being 25 ft. 9 in. above the point of entry of the flue outlet to the fire.

On June 10 you published our criticism of these figures, which made clear the fact that the effect of the chimney draught on the "Wizard" fire was to reduce its radiant efficiency by about 4·4 per cent.; whereas the effect of the same chimney draught on the Davis fire was to bring about a reduction of only 1·65 per cent.—meaning, in other words, that only 92 per cent. of the heat originally radiated from the Wizard fire was available when the chimney was brought into play, whereas, in the case of the Davis fire, no less than 96·4 per cent. of the heat originated was still available when the chimney draught was in operation.

It is interesting to note that the Wizard represents a fire of the high-canopy type, and that Professor Bone's figures give results varying greatly from those obtained by Mr. Hartley.

Despite the statement of Mr. Yates on Sept. 3, 1912, and his endeavours to condemn by independent investigation the principle we advocated, it is interesting to note that the majority of the fires his Company had on show at the National Gas Exhibition were made on the principle advocated by us, and condemned by Mr. Yates so persistently during the present controversy. Having done this, Mr. Yates now turns round and endeavours to swallow at one mouthful his statement of Sept. 3, 1912 [quoted above], which act he endeavours to obliterate by the following statement, as published in the "Journal" for Nov. 18: "That the claim was made for a certain construction of gas-fire that it got rid of the products of combustion without the aid of a chimney pull. I criticized not that object, but the method of construction by which it was sought to be obtained." A comparison of this statement with that of Sept. 3, 1912, is we feel sufficient to show the great change of attitude Mr. Yates has taken up.

Reviewing the whole position, it would appear that in 1910 Mr. Yates made claims which, in our judgment as recently shown, could not be substantiated. In 1912, he condemns (if there was any meaning in his words) the principle on which his claim of 1910 was based. This he follows up by altering the construction of his fires, so that the principle which he condemned is embodied in their construction. At the same time he entirely changes his personal attitude—accepting the principle, but disagreeing with certain details in the construction of certain fires which are now in their third season, and are not only maintaining, but are vastly increasing satisfaction. On this latter point, we are more than satisfied to allow readers to be our judges; but we could not pass over the opportunity of making clear the changed attitude of one who has, we consider, assumed the position of dictator of the principles on which modern types of gas-fire should be constructed.

Testing Methods.

Coming in Mr. Yates's lecture to the interesting question of testing methods for thermal efficiency, the most important is undoubtedly the one for radiant efficiency. In conjunction with Mr. Yates's observations, we should like to consider the letter in the "Journal" for Nov. 18 from Professor Bone.

The method known as the Leeds test has undoubtedly for some time past been looked upon as the standard method; but that it is not all that it might be, and for works' purposes all that it should be, is to our mind conclusively proved by the fact that so many investigators have turned their attention to its modification, or to the introduction of some entirely different system. Professor Bone, in the course of a letter the terms of which have been already criticized, endeavours to show that no alteration is necessary, and yet concludes his letter by saying that he, in conjunction with others, is at the present time engaged on the investigation of a method which Mr. Yates, in his lecture, says may eventually entirely depose the Leeds method. In addition to this, there are in Mr. Hartley's lecture some very useful criticisms of the method. There is the further evidence that Mr. John Bond, of Southport, who has made a great study of this subject, has, we believe, turned his attention to methods of testing much more readily applied, from which very useful comparative results for works purposes can be obtained. Again, Messrs. Wilsons and Mathiesons have expressed themselves in sympathy with this method, and apparently refrain from the use of the Leeds method. Mr. Glover, of Messrs. R. & A. Main, has already published a description of a calorimetric method which he has used; and Mr. Butterfield has also described a calorimetric method which we have had in use for nearly five years, and from which every satisfaction is obtained.

Mr. Yates, however, has made very definite assertions as to the shortcomings of the calorimetric method, and states that, if the radiometer be large, it suffers three defects: Firstly, the difficulty of obtaining perfect circulation of the water; secondly, the loss of heat from its cold side by radiation, &c.; and, thirdly, errors due to time-lag. On the other hand, if the radiometer be small, Mr. Yates asserts that it must be placed so near the fire that the natural movement of the air currents is interfered with, and the result is vitiated in this way.

So far as Mr. Yates's knowledge of the radiation calorimeter goes, his criticisms may be justified. But we have in use a form of water radiometer, the size of which is very moderate indeed, and is not sufficiently large to introduce the defects mentioned by Mr. Yates when referring to the large radiometer. Further, it is of such a construction that it need not be placed any nearer the fire than the parts of the apparatus used in the Leeds test; nor does it in any way interfere with the natural passage of air to the fire. It is a method which gives a very complete knowledge, not only of the total radiant efficiency of the fire, but of the distribution of the radiant energy over the semi-hemispherical area immediately in front of the fire. Further additions are being made to this method of testing; and we hope at a future date to be able to show some of the results obtained, with an indication as to how the records are made, together with a complete description of the apparatus.

We think that investigation of this sort justifies the technical staff of a gas-stove works in believing that the knowledge gained would be of great use in a conference such as was suggested recently in the "Journal," and that despite the fact that Professor Bone has expressed his opinion that the knowledge of these staffs is not such as to justify their co-operation with the great men of science.

Institution of Water Engineers.—The winter general meeting of the Institution will be held on Saturday, the 13th inst., in the apartments of the Geological Society, Burlington House, W., when, in addition to the formal business, four papers will be presented. The titles and authors of these are as follows: "Compulsory Returns by Water Undertakings," by Mr. John Chisholm; "Portland Urban District Council Water-Works," by Mr. R. Stevenson Henshaw; "Solubility of Carbonate of Lime and its Bearing upon the Treatment of Water Supplies," by Mr. W. T. Burgess; "Treatment of Plumbo-Solvent Water by Mechanical Filters," by Mr. F. J. Dixon.

The "Fuel" Number of "The Times."—The British Commercial Gas Association secured the first page of the great "Fuel" number which "The Times" issued yesterday, and occupied it with a striking advertisement of the modern domestic fuel—gas, the use of which in producing comfort in various departments of the household is very effectively illustrated. In the number, descriptions are given of the methods of manufacturing all the different varieties of gaseous fuel, and of the advantages attendant upon their use, and there are articles on the application of coal gas to domestic and industrial heating, and on the remarkable development of the art of lighting by gas.

CARBONIZATION IN BULK FOR GAS PRODUCTION.

By G. Stanley Cooper, B.Sc., F.C.S.

The general tendency of carbonization in recent years has been to work with increasing quantities of coal per charge, and it is now the usual practice to work with full retorts. Largely, too, owing to continual labour troubles, mechanical coal and coke handling plants have been widely adopted; and this has necessarily led to great improvements being made in all mechanical arrangements, and a high state of efficiency, with a minimum amount of attention, can now be obtained. The necessity, therefore, of employing mechanical labour-saving devices has been one of the factors which have helped forward the system of carbonization in bulk for gas production. Again, it has long been recognized that an enormous loss of gas takes place in the retort-house every time a retort is charged. Filling the retorts reduces the number of charging operations, and hence saves a large amount of gas. By increasing the charge, say to 10 tons—as is the case in bulk carbonization—the number of charging operations is considerably reduced; hence less labour is required and there is less loss of gas.

The Gas and Residuals Produced.

The question now arises: Can charges of 10 tons of coal and the resulting 6 or 7 tons of coke be satisfactorily handled? Undoubtedly they can, owing largely to the fact that long experience in such handling has been gained on coke-oven plants, and the requisite machinery has reached a very high degree of efficiency. It will also be asked: Are the results obtainable sufficiently encouraging to warrant the adoption of bulk carbonization? By results are meant the quantity and quality of the gas, coke, tar, ammonia, &c., and not the gas only. I shall show at a later stage that, taking all these together, the results of bulk carbonization are every bit as satisfactory as those obtainable by ordinary systems of carbonization. I should here point out that, in bulk carbonization, although the same amount of gas can be obtained as by other systems, the candle power of the gas is usually slightly lower. But in these days of incandescent lighting, candle power is only of minor importance.

It is the calorific power which counts; and as far as this factor is concerned, all requirements can be met. It must not, however, be imagined that with bulk carbonization the gas produced is devoid of illuminating power, as this is far from being the case. It is not at all difficult to maintain a standard of 14 to 16 candle power measured by the No. 2 "Metropolitan" burner, and this is quite sufficient for ordinary requirements.

The Oven Used.

I wish it to be distinctly understood that in this article I am not referring to ordinary coke-oven carbonization, but to bulk carbonization in chambers specially built for the purpose of gas production. Ordinary coke-oven gas, as usually made, often contains up to 10 per cent. of nitrogen, and consequently its illuminating power and calorific value are both lower than is desirable in gas for town purposes. The cause of this is that no proper precautions are taken to exclude all air from the ovens. On gas-ovens proper, however, the doors are quite gas-tight, and consequently the composition of the gas does not suffer. In the early days of bulk carbonization, the large chambers used were built on the inclined principle; but many difficulties accompanied the adoption of this system. Consequently, in some cases it was discarded, and horizontal chambers were used. Munich chambers are, however, still built inclined, and good working results are being obtained with this system.

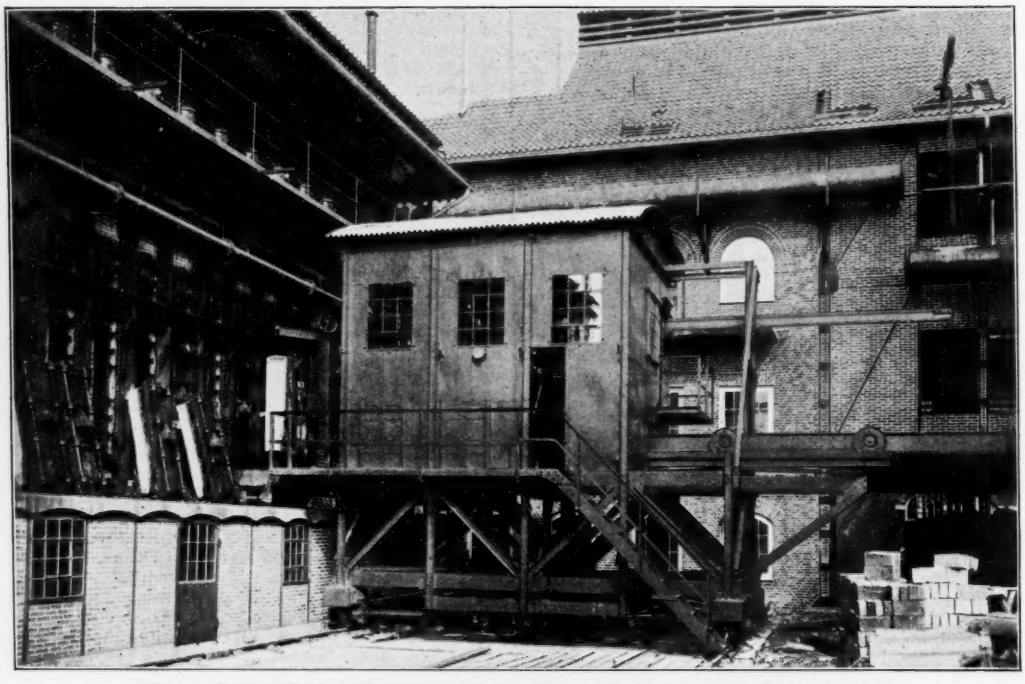


FIG. 1.—THE OVENS AND THE COKE-PUSHING AND COAL-LEVELLING MACHINE.

In coke-oven practice, the ovens are heated by the gas evolved from the coal during carbonization. The Koppers horizontal chamber-oven, a development of the Koppers regenerative coke-oven, has been designed to meet the requirements of gas-works as regards carbonization in bulk. It embodies all the features referred to above, and has been adopted at a number of Continental cities, including Vienna, Buda-Pesth, Berlin, Kiel, &c. In coke-works, the principal aim is, of course, to produce the best possible quality of coke suitable for metallurgical purposes. The gas obtained is used principally for heating the coke-ovens, for boiler firing, and for gas-engines. In gas-works, on the other hand, the principal object is the production of the greatest possible amount of illuminating gas, and the coke obtained is regarded more or less as a bye-product.

Heating Systems.

The most important alteration necessitated in the gas-oven was that the whole of the gas evolved from the charge should be available for illuminating purposes, and hence some other means must be found for heating the ovens. This was best dealt with by the introduction of a central producer-gas plant, erected quite apart from the chamber-ovens. The producer gas was further to be preheated before combustion, just as the air is preheated in the case of the regenerator coke-oven. Consequently the design of the oven was altered slightly in order to accommodate these new features. In the main, however, especially as regards the arrangement of the heating flues, the oven is similar in every respect to the regenerative coke-oven.

As already pointed out, the ovens are heated by producer gas, made in a separate producer-gas plant. The great advantage of this system is the fact that coke breeze and low-grade fuel generally can be used in the producers, without lowering the efficiency of the plant. The producer gas is cleaned before use, in order to prevent the deposition of dust in the heating flues, and consequent damage by fusion of the dust with the brickwork material. It can be further arranged that the ammonia formed in the producer is removed from the producer gas before use, thereby lowering the working costs of the producer plant. This is being done at the installation of Koppers ovens at Saltley Gas-Works, Birmingham, where Mond producers are used.

In connection with the whole of the installation of Koppers ovens on the Continent, the Kerpely gas producer is employed. The Kerpely producer has been specially designed for the gasification of fuel of the lowest grade. Its principal features are as follows: (1) The revolving mechanical grate and water-cooled jacket—this latter preventing the adhesion of clinker to the sides of the producer. (2) The automatic ash discharge, which considerably reduces the labour costs. (3) The duplex air and steam supply, which allows of the regulation of gasification, and secures

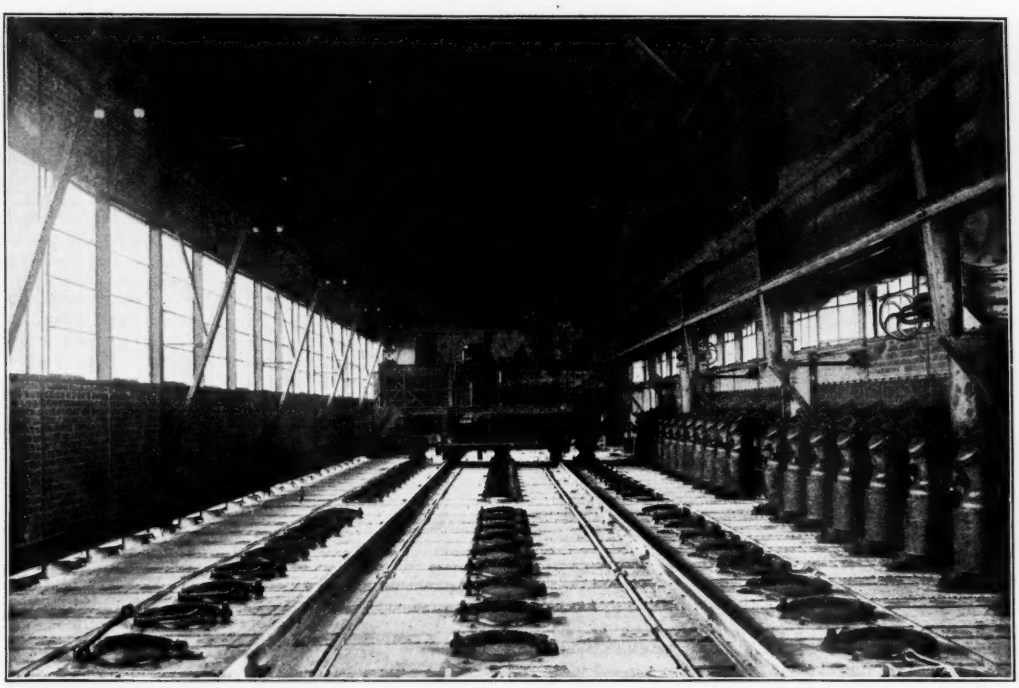


FIG. 2.—THE TOP OF THE OVENS, SHOWING THE CHARGING LORRY.

uniform combustion over the whole grate area. Owing to the loosening effect of the grate, the blast is uniformly distributed, and consequently the composition of the gas made varies very little indeed. The following is an analysis of an average sample of the producer gas:

CO	29·84 per cent.
H	9·12 ,, ,,
CO_2	2·78 ,, ,,
CH_4	0·8 ,, ,,

The calorific value is about 137 B.Th.U. per cubic foot.

Advantages of Bulk Carbonization.

With installations of Koppers chamber-ovens it is possible to arrange that all the work of charging and discharging the ovens

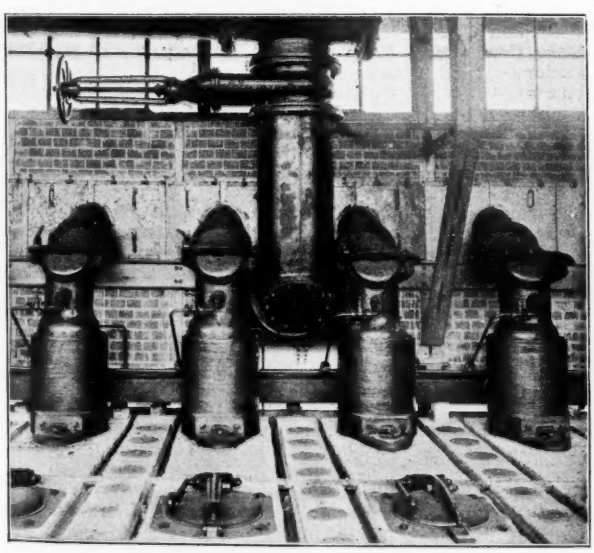


Fig. 3.—The Ascension Pipes and Gas-Collecting Main.

shall be done during the day time, thus reducing the labour costs, and also ensuring adequate supervision by skilled men.

The advantage of bulk carbonization in horizontal chamber-ovens may be summarized as follows:

1.—Reduction of labour costs, owing to the use of mechanical appliances, and to the smaller number of charging and discharging operations.
2.—Low fuel consumption and cost, owing to the use of gas produced from coke breeze and low-grade fuel.
3.—Increased yield of tar and ammonia.
4.—Superior quality of the coke produced.
5.—The tar produced is of a character much superior to ordinary gas-works tar.

Some Actual Results.

With regard to the results obtained on plants of this description, I give herewith figures taken from a table which embodies the results of a test carried out on eighteen ovens at Vienna over a period of six days.

Quantity of coal charged			1169·76 tons
Quantity of coal charged per oven per day			10·83 tons
Time of carbonization			23 hrs. 35 mins.
Production of gas per ton of coal, corrected to N.T.P. (coal containing moisture and 8 per cent. ash)			11·833 cubic feet
Calorific value (average) per cubic foot			612 B.Th.U. gross
			Per Cent.
Analysis of gas.	CO_2	..	2·60
	C_nH_m	..	2·93
	O_2	..	0·37
	CO	..	9·17
	H_2	..	53·27
	CH_4	..	28·20
	N_2	..	3·48

Ammonia Recovery.

The yield of ammonia obtained at this plant is higher than on other plants from the same coal, while the tar is far superior to ordinary retort tar. It is of a light fluid character, and contains only a very small amount of free carbon—usually not more than about 5 per cent. At the new gas-works at Buda-Pesth, a very interesting development has taken place—viz., the adoption of Koppers' direct-recovery process for the recovery of the ammonia from the gas. This is the first instance of a large gas-works adopting the direct process; but it is sure to come into more general use in the near future.

Koppers Installations at Kiel and Königsberg.

The illustrations reproduced show various sections of the installation of Koppers horizontal chamber-ovens which has just been completed at the City Gas-Works, Kiel. The chambers are of the usual Koppers type, each having a capacity of about 10 tons of coal per charge. The ovens are heated by means of producer gas made in Kerpely rotating-grate producers. The ovens are charged by means of a lorry, which runs on top of the setting (fig. 2). This machine is electrically operated, and has three hoppers capable of holding one full oven charge. The hoppers have openings at the bottom by which the coal is charged through three corresponding openings in the roof of the oven. Hence the operation of charging the ovens is very quickly carried out with the minimum loss of gas. The design of the oven doors will be noticed from fig. 1. The doors are of the self-sealing type, and are water cooled. They are removed from the oven by means of a lifting arrangement attached to the combined coal-levelling and coke-pushing machine. In fig. 1 one of the doors is seen on the lifting gear. The coal is carbonized for a period of 24 hours, at the end of which time the whole of the gas is evolved. The coke obtained is of excellent quality, and far superior to ordinary retort coke.

At Königsberg, still another development of bulk carbonization is met with. At the gas-works there, Koppers combination coke and gas oven has been installed. This oven is so designed that it can be worked at will as a coke-oven or as a gas-oven. In the former case the oven is heated by means of a portion of the gas evolved from the coal during carbonization. About 50 per cent. of

Fig. 4.—View in the Passage Way, Showing the Gas and Air Regulation Fittings.

the total gas is required for this purpose; and only the air necessary for the combustion of the gas is preheated. When the oven is operated as a gas-oven, however, it is heated by means of producer gas; and in this case both gas and air are preheated. The whole of the gas evolved from the coal is therefore available as town gas. At Königsberg it is intended to operate the ovens as coke-ovens in summer, when so much gas is not required for town use, and as gas-ovens in winter, when a large amount of town

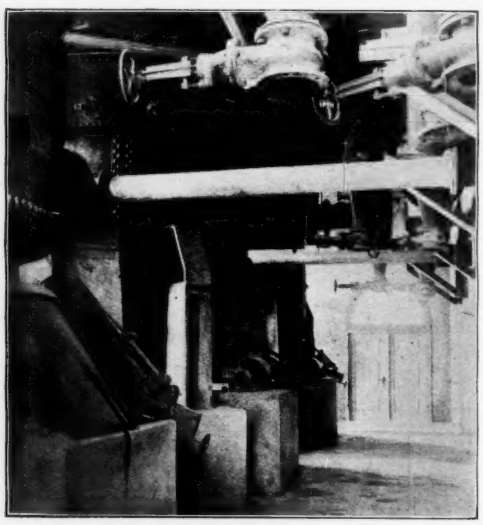


Fig. 5.—The Kerpely Producers, Showing the Arrangement for the Automatic Ash Discharge.

gas is required. By adopting this arrangement, great flexibility of production is obtained. The tar and ammonia are to be recovered from the coal gas by means of Koppers' direct-recovery process. In summer, benzol will also be recovered from the portion of the gas which is to be used for the purpose of heating the ovens. As the conversion from a coke-oven to a gas-oven can be made almost instantaneously, it will be seen that the plant possesses excellent facilities for meeting a rapidly increasing or decreasing demand for gas.

VISIT TO THE CHINGFORD RESERVOIRS

By the London and Southern Junior Association.

A VISIT which had long been anticipated with pleasure was paid on Saturday afternoon to the Chingford reservoirs of the Metropolitan Water Board, by members of the London and Southern District Junior Gas Association. The object, of course, was to see the Humphrey gas-pumps which have been installed there; and see them the visitors did. But to the great disappointment of the large muster who took part in the outing, the pumps were not at work. Mr. Whynarah, the Engineer in charge of the station, on meeting the members at the entrance, explained the state of affairs—that the pumps were being overhauled previous to starting their career under the Water Board. Under these circumstances, the best he could do was to explain the working; and this he did thoroughly. His hearers found little difficulty in following what he had to say, owing to the fact that less than twelve months ago Mr. H. de P. Birkett, B.Sc., read a paper before the Association, which fully described the Humphrey pump and its method of working.

The party were first taken to the house in which the five pumps are installed. Four of these are capable each of delivering 40 million gallons of water daily from the River Lea into the reservoir; while the fifth is of half the capacity. A lengthy stay was made here, and then there was a move to the top of the reservoir embankment, from which point a view was secured of the inlet pipes. The reservoir is a long way from being full now; but a glance at the immense sheet of water confined by an embankment 4½ miles in length affords a striking object-lesson in the magnitude of the problem presented by the water supply of a great city. Then, passing the gasholder of 5500 cubic feet capacity, the house was reached in which the Dowson gas is made for operating the pumps. Here, again, of course, absolute stillness reigned, so far as the plant was concerned; and those present had to imagine to themselves how things will look at a time of torrential rainfall, when it is desired to secure every available drop of water as it flows into the river. Those who are familiar with ordinary pumping installations cannot fail to be struck by the modest amount of space covered by the plant, in comparison with the enormous quantity of work it is capable of performing.

Before leaving the spot, the President of the Association (Mr. S. A. Carpenter) voiced the general feeling that the main object had been missed by their not being able to see the pumps at work. At the same time, he acknowledged the trouble that had been taken by the Engineer to give the members all the information they desired.

Coke Supplies to London.

It will be recalled that, in the course of some remarks he made at the recent meeting of the Southern District Association of Gas Engineers and Managers, Mr. Edward Allen stated that the circumstances of the supply of coke to London were far from being satisfactory, and, as President of the Institution of Gas Engineers, he had arranged for a letter to be sent to those undertakings that supplied coke to the London district, asking them to take part in a conference. This conference was duly held yesterday afternoon, at the offices of the Institution in Victoria Street, S.W., when Mr. Allen presided over the gathering, which included the following gentlemen: Mr. D. Milne Watson (Gaslight and Coke Company); Mr. W. Doig Gibb and Mr. F. M'Leod (South Metropolitan Gas Company); Mr. Stanley H. Jones (Commercial Gas Company); Mr. Wilfred Wastell (South Suburban Gas Company); Mr. A. A. Johnston (Brentford); Mr. A. E. Broadberry (Tottenham); Mr. W. W. Topley and Mr. A. Caddick (Croydon); Mr. W. B. Farquhar (Ilford); Mr. W. H. Bennett (Redhill); Mr. W. E. Price (Hampton Court); Mr. E. E. Rudge (Secretary to the London Coke Committee); Mr. Hubert Pooley and Mr. E. W. Frost (Leicester); Mr. Charles Wood (Bradford); Mr. R. S. Hilton (Birmingham); Mr. S. Meunier (Stockport); and Mr. Arthur Andrew (Oldham). The whole question of coke supplies to London was discussed, in the course of a lengthy sitting; and an arrangement was come to under which the leading Midland undertakings who are accustomed to send coke into London are going to exchange information with the London Coke Committee. Throughout the proceedings, much stress was laid by everyone upon a point which is clearly of great importance—and that is the necessity for every undertaking endeavouring to find in their own district fresh uses for coke. No possibility of bringing about an increased consumption in this way should be overlooked.

Examinations in Gas Fitters' Work.—It will be seen, from the notice of the last report of the Department of Technology of the City and Guilds of London Institute which appears elsewhere, that, acting on the advice of the Institution of Gas Engineers (the Council of which is one of the Institute's Advisory Committees), a new syllabus of instruction and examination on "Gas Supply and Gas-Fitters' Work" is in course of preparation.

Manchester and District Junior Gas Association.—We learn from the Hon. Secretary (Mr. J. Bridge, of Stretford) that arrangements have been made for the members of the Association to visit the Bury Gas-Works next Saturday afternoon, on the invitation of the Gas Committee and the Engineer and Manager (Mr. H. Simmonds). After the visitors have partaken of refreshments (kindly provided by Mr. Simmonds) at the works, Mr. J. W. Thornley, of Salford, will read a paper entitled "Notes on Illumination by Low-Pressure Gas."

Strengthening and Improving Gas-Mantles.—In the course of an article, "Useful Hints in Home Economies," in last Tuesday's issue of the "Evening Standard," the writer mentions that "among the many little economies which may be practised at home is that of preserving the working life of gas-manties." It is said "this may be done by dipping the new mantles, before they are used, in vinegar. They must then be hung up to dry, and when dry, fixed in position, and set alight in the usual way," when they are said "to give a brighter light and to last longer." Possibly some of our readers have tried the effect of this treatment; and if so, it would be interesting to know with what result.

NOTES ON SOME POINTS IN MODERN GAS-STOVE CONSTRUCTION.

By F. S. Larkin, A.M.I.Mech.E., Local Manager of the Stove and Meter Department of the Gaslight and Coke Company, Fulham.

[A Paper read before the London and Southern District Junior Gas Association. Nov. 28.]

About two years ago, I started experimenting with a view to finding out whether it was not possible to provide hot water for some domestic purposes for a class of consumer to whom the initial cost of installing a geyser or hot-water circulator was a serious drawback. This I will refer to later. During these experiments, I found that what I could do with impunity with one cooker, was altogether out of the question when applied to another. The cause of these differences I have done my best to ascertain; and, on the advice of Mr. F. W. Goodenough, have embodied the results in the form of a paper, which I have pleasure in submitting for your consideration this evening. Briefly it may be split up into three headings: (1) Crowns; (2) Flues; and (3) Burners. Each is, however, so dependent on the other that it is only by combination of the proper proportions of all three that the most economical results can be obtained.

Some Cooker Experiments.

In making the experiments, the cookers were treated as nearly as possible as when in use. The gas was turned on full for the first 15 minutes, and then so reduced as to maintain an even oven temperature of 450° Fahr. The results were then run out in cubic feet of gas per cubic foot of oven space for 1¾ hours. This figure was found to vary from 11·52 to 15·76—showing a difference of 4·24 cubic feet of gas per cubic foot of oven space measured from the crown to the centre line of the burners for the same amount of work. Now, as these were all what we should consider "high-grade" cookers, the difference in the quantity of gas necessary to raise and maintain the heat of the cooker for 1¾ hours at a given temperature was very large; and the question of the why and wherefore had to be faced.

Naturally, the first thing I did was to reduce the size of the flue; but this was immediately followed by the smothering of the burners, though another cooker, even smaller in cubical contents, would pass the same volume of gas easily through a smaller flue. I then tried altering the crowns, but found that the flame, which had been perfect with the open crown, as in figs. 1, 2, 4, and 5, immediately smothered when the crown was altered similar to that of figs. 3 and 6, though the same size flue was used.

Not liking to be "done," I then turned my attention to the burners, and tried all kinds of different shapes, until almost every theory I could advance had been tested. I made a little progress here, however, for I found that the flame from the burner with a small bore took much more smothering-out than the flame from a burner with a larger bore, though the size and number of the jets were the same. It seemed that the velocity of the mixture in a burner of ¾-inch bore was almost lost, burning with a very flabby-looking flame, which was occasionally beaten down; while, with the same volume passing through a burner of ⅜-inch bore,

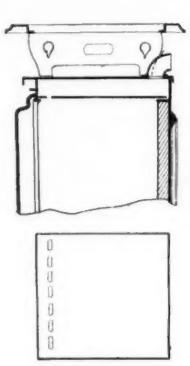


Fig. 1.

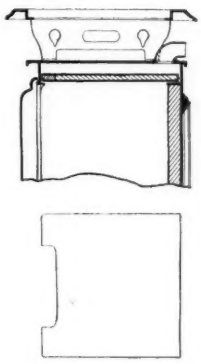
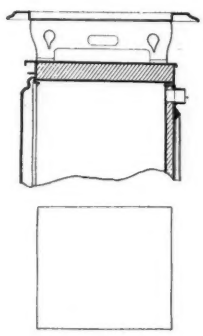


Fig. 2.



Figs. 3. & 6.

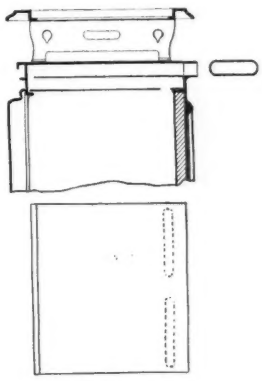


Fig. 4.

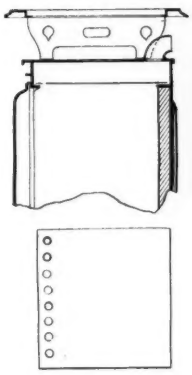


Fig. 5.

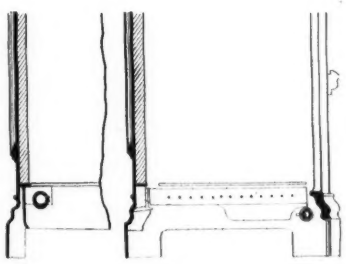


Fig. 7.

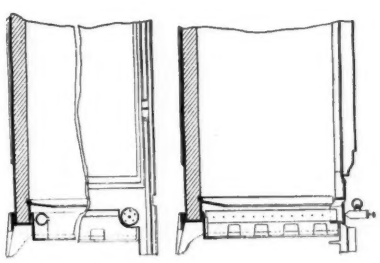


Fig. 8.

the flame was stronger and sharper, seeming as if the velocity of the mixture was maintained right up to the point of ignition, due to the greater resistance. A still further improvement was found when the primary air, instead of being taken from the inside of the cooker—as is very general now (see fig. 7)—was taken direct from the outer air (as in fig. 8), the burner being brought through the front casting for this purpose, and an air-chamber fitted on. Still the result was not entirely satisfactory, as, when the gas was full on, there was still a great tendency to smother; and it was not until the burners were lowered so that the centre line was about ½ inch below the edge of the front casting that satisfactory results were obtained. I now found that the flue could be easily reduced to a great extent, without smothering the burners and working on the above lines; a proportion of 1 square inch of flue area per cubic foot of oven space giving very satisfactory results, at varying pressures and consumptions.

The crown construction of various cookers varies considerably; and sketches have been made showing in detail the most popular type: Fig. 1, open cast inner crown. Fig. 2, open tile inner crown. Fig. 3, packed cast crown. Fig. 4, open double sheet enamel. Fig. 5, open single sheet enamel. Fig. 6, packed sheet enamel (see fig. 3). My experiment points to the fact that the packed crown is the most economical; and treating a series of cookers thus, and reducing the flue as stated above, I got the following consumptions of gas.

—	Contents of Oven Centre Line of Burner to Crown.	Open Crowns.		Packed Crowns.	
		Consumption.	Cubic Feet of Gas per Cubic Foot of Oven Space.	Consumption.	Cubic Feet of Gas per Cubic Foot of Oven Space.
	Cubic Feet.	Cubic Feet		Cubic Feet.	
A	2·53	27·81	11·00	25·10	9·92
B	2·35	31·72	13·49	25·43	10·82
C	2·17	32·03	14·76	23·02	10·60
D	2·08	30·18	14·50	23·18	11·14
E	2·44	30·48	12·50	25·44	10·42
F	2·27	27·15	11·96	24·02	10·58
G	2·03	32·00	15·76	27·49(cast)	13·54
				22·25(sheet)	10·96

The above are gas consumptions to raise and maintain a temperature of 450° Fahr. for 1¾ hours. The flues ranged in size considerably; the smallest having an area of 1·16 square inches per cubic foot of oven space, and the largest 2·19 square inches.

There certainly is not a vast amount of difference in consumption due to the various crown constructions, as you will see from he following figures. I took an ordinary "Horseferry" stove, and altered the crown to the various types, so as to make a comparison. In each test the cooker was alight for about an hour

before taking the readings; and the room was kept as near the same temperature as possible, and readings were taken every five minutes.

Type of Crown.	Gas Used in One Hour to Maintain a Temperature of 450° Fahr.	
	Cubic Feet.	
No inner crown	13·16	
Cast inner crown, fig. 1 .	12·00	The temperatures were in all cases taken in the centre of the cooker, at a height one-third down from the crown to the centre line of the burners.
Tile ,, ,, ,, 2 .	11·94	
Packed cast inner, ,, 3 .	10·86	
Double sheet enamel, ,, 4 .	10·79	
Single ,, ,, ,, 5 .	10·77	
Packed ,, ,, see ,, 3 .	10 59	

By reducing the flue (originally 1⅜-inch) to ⅝-inch the consumption only dropped to 10·37 cubic feet, showing that the efficiency was down almost as low as possible. From this, it is evident that the advantage—though small—lies with the packed crown. Or, if you prefer an open crown, then have the inner part as thin as possible, so that the gas passing away may be kept at a high temperature till the last stage.

The cause of the difference seems to me to be the fact that, with the ordinary open crown, an oven temperature of 450° Fahr. has a flue temperature of 380° to 400°. With the packed type, the flue temperature is practically the same as the oven.

Now if your flue is just the correct size to pass the gases from the open crown at (say) 400°, when you convert to the packed type the area of the flue is not large enough by about 10 per cent. to pass away the same quantity at a temperature of 450°, as it has a larger volume. Hence the smothering of the burner. We can, then, partly look on the open crown as a means of cooling the gases sufficiently to allow them to pass, when full on, through a moderate sized flue; for without this open crown smothering takes place, though you will see from the previous tests that the loss of the inner crown, when the gas is turned down, is a serious matter.

I have come to the conclusion that in a number of cases the flue, as at present constructed, is far too large for economical cooking. True, it is not too large when the gas is full on (say) at 30-10ths pressure; but is that necessary? If the burners are supplied with external primary air, and are in what I think you will agree is the most efficient position, what does it matter if, during the warming-up of the oven, some slight amount escapes from under the casting, provided that, when the gas is turned down for cooking only, a little over the quantity of the secondary air for proper combustion is passing through the oven? As it is now, you have a strong current of air passing through upon which you have to expend more gas in heating over and above what would otherwise be required, and which is responsible to a large extent for the slight loss of weight of the joint.

I maintain, therefore, that we can afford to considerably reduce the flue outlet, if we pay proper attention to the position of, and the supply of air to, the burners. I may be told that by the burners being put in this position there is the risk of their blowing out. I think, however, that the risk, where the inlet is high and from the front, with the sides and back covered in, is not so great as in cases where there is a vent all round the base of the cooker and the air current passes freely across.

In a leading article in the "Gas World" of July 5 last, there were two or three remarks which call for comment. It was stated there, referring to cooker explosions:

> Observations on similarly defective cookers show that only one row of burners is extinguished, the air from which the oxygen has been denuded by combustion always attacking the weakest bunsen first. The flames being extinguished on one side allows the escaping gas to join the flow of air to the other side, and when existing as an explosive mixture the usual results follow.

From this you would infer that the explosion took place from ignition in the oven; but I think you will find that in nearly every case the ignition is from a burner alight on the hotplate. The oven gas goes out, and the door is opened to ascertain the cause. The heated mixture in the oven then rushes out of the top of the door, and ignites at a hotplate burner. I cannot recall that even in one of the few explosions I have heard of has gas ignited from the oven.

Again, which is the weaker burner? I have tried to find out over and over again, without success. In any cooker which is smothering, you will always find one burner better than the other. Take the "bad" injector out and check the gas a little, and you will find that in all probability you have a good flame that side now, while the other one, which was all right, is now the offender. Treat this one the same, and you will find that the "bad" side has again reversed itself. And so you may go on, checking down and down, until you have reduced the gas consumption to that volume which the flue can properly pass out. The fact of the matter is that the "good" flame is in nine cases out of ten the one lighted first. It gets a start, and all attempts of the other to overcome it are fruitless, as, burning with a proper flame, it is generating more heat, and therefore has a stronger upward current—thus keeping the other back. Open the door and shut it sharply, and you will very likely find that the smothering has changed over sides. I have done this a number of times with the same result. As the door slams to, whichever side gets the first "pull" burns properly, and the other is smothered.

I see no reason why the gas from the burner that has gone out should travel across the cooker to the burner left alight, through the continuous current passing in the oven. Its natural course is up and away through the flue, which it can pass easily now that, as combustion is not taking place, its volume is so much less. On several occasions I have left the one side burning, but have seen no signs of any tendency to explosion. The only time an explosion would take place from the oven is when the door is opened quickly, and a taper or match is put down at once to re-light the burner. If this were done from below, it would be all right, but, if done from the top, the flame comes in contact with the mixture rushing out, and explosion follows.

These explosions are caused, we are told, through gas cookers having narrow spaces in the crown; but why build cookers with these open crowns, if there is any idea that they are a source of danger? I think the tests I have submitted to you show that—even if it is only slight—there is an advantage in the packed crown. Why not, then, make them all of this type, where you have no inaccessible places to get at for cleaning? The only objection to the packed crown is that you sometimes get a slight amount of condensation when first heating-up; but this, I think, is not enough to be the cause of complaint. And surely the very fact that condensation takes place proves beyond a doubt that the heat is held in the cooker instead of passing through the flue, as in the open crown type.

It is also said that taking the gases from one point is not conducive to nice browning all over. With the browning-shelf in use, as it is now, I do not think this argument can apply. It is quite correct that in some cases the space allowed between the inner and outer crown is totally inadequate; and it does not take long for a deposit to congregate here to an extent which must, sooner or later, lead to trouble. I cannot say that it is our experience down South for a cooker to get stopped up in the crown to this extent; but from what the makers tell us, this complaint is far more common in the Midlands and in the North. If you adopt the open type, then, from the tests made, the inner crown should be as thin as possible—*e.g.*, enamel plate—so that the space between the crowns is kept as hot as possible by the oven; and this sheet should be made removable for cleaning, as is done in a few cases, and so constructed that, however replaced by a careless person, there is still a full vent for the gases.

It seems almost silly at first to say that a tin of water laid on the outer crown of the cooker would reduce the gas consumption, while maintaining the same oven temperature. Such, however, is the case. It is simply like the eiderdown on the bed—it keeps in the heat. In the ordinary way, the high temperature of the gases passing between the crowns is rapidly absorbed by the lower temperature of the atmosphere; and convection currents being set up, a constant supply of cooling air is brought to the hot surface.

With a tin of water lying on top, however, different conditions exist. As soon as the water begins to warm, it, to a certain extent, prevents this free radiation. Consequently the flue temperature goes up, and the oven consumption can be reduced to maintain the same oven temperature. A tank on the top of a cooker would be a good deal in the way; otherwise a certain amount of water could be warmed up here with economy. A tank could, of course, be made to lift off and on; but this, if of sufficiently light material, would soon leak through usage.

Some makers fit their cookers with dampers which cannot be entirely closed; and I cannot see that we shall get down to the rock-bottom of economy in cooking until the oven damper is regulated by the oven cock. For when you have the gas turned down low, it is marvellous what a small vent is required to pass the products. My experience of the dampers at present in use is that they are left either open or closed by the fitter when connecting up, and never interfered with afterwards by the consumer. Our lady demonstrators could tell you of a number of cases where they have found the flue outlet stopped up with rag, &c.; and on asking why this had been done, they have been told, "Why! all the heat was escaping from there."

In summing up, I would advocate four important points for consideration, as bringing the cooker nearer perfection.

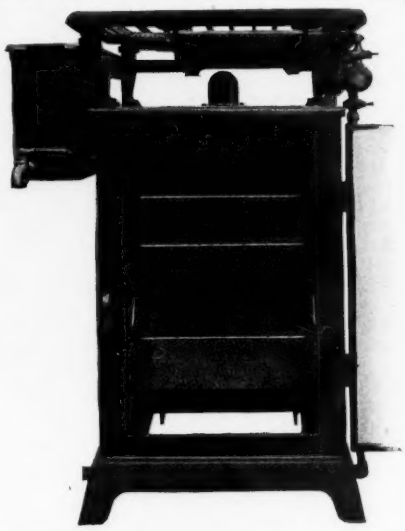
1.—The crown to be packed, and a direct flue outlet provided from the oven.
2.—An oven damper regulated by the oven cock, and so constructed that the outlet cannot be entirely closed.
3.—Primary air for the burners to be obtained externally.
4.—Oven burners to be fitted in such a position that if there is any throttling of the outlet the flames will not smother.

In order to demonstrate the fact that it was possible to construct a cooker which would not smother-out, one of our ordinary cookers (which I have pleasure in showing you here) was converted. It caused a well-known maker's representative much amusement to see the flue, normally 1⅜-inch diameter, fitted with discs of 1, ¾, ½, and ¼ inch, and finally being stopped up altogether with a cloth, without the flames being seriously affected. On testing, the greatest efficiency was found to be with a ⅝ or ¾ inch outlet. When throttled below this point, the heat to a great extent drove out below, instead of heating the oven. Please do not think this construction is recommended; the experiment being made simply with the idea of showing that a cooker could be so fitted that smothering is almost impossible.

Water Heating in Cookers and Fires.

Now, if you will allow me a few minutes more, I will explain the method of water heating already referred to. We are all

anxious to save expense at home if we possibly can; and I was tempted to see if we could not get sufficient hot water for washing-up purposes without seriously affecting the oven. This, I think I may say, I have been successful in doing by the example I am showing you here. I have now had one at home fitted on a Davis No. 8 cooker for over a twelvemonth, and only on two or three occasions have we had to heat water in a kettle for this purpose.



The Larkin "Surprise" Boiler attached to a Gas-Cooking Stove.

You will see that the appliance could not be more simple. A coil of pipe passes round the top of the cooker, and is connected to a tank outside. Circulation is set up, and the water in the tank heated. In round figures, my experiments have shown that, even in a small sized cooker, only about 2 cubic feet of extra gas is used in the oven in actual test to heat 1½ gallons of water to a temperature of 150° Fahr.; and in some cookers there seems to be hardly any difference at all in gas consumption. The same amount of water heated afterwards in kettles would require between 5 and 6 cubic feet. This saving is effected while cooking a joint which requires 1¾ hours. In some cookers a water temperature of 180° is obtained.

An article of this description, in order to be satisfactory, must be as simple as possible, and one that can be attached to almost any cooker. Better results can be obtained by taking the flue through the water or between the tank and an outer casting. Here, however, we are up-against renovation and maintenance; and it is essential that the article shall be both strong and simple, and so constructed that these items are reduced to the smallest possible cost, while maintaining efficiency as far as circumstances will allow.

In ordinary use, you will find that the cook cannot distinguish when the boiler is in use or not. When she turns the gas down, it is to "just about that;" and my experience is that "just about that" may mean anything within 4 or 5 cubic feet per hour on an ordinary sized stove. Testing the heat of the stove as a cook does with her hand, it is impossible for her to tell at what heat she is cooking within 20° or 30°, with a temperature ranging between 400° and 450°. Let me give you a case in point. I was anxious to discover what extra gas would be used on a Richmond "Bungalow" cooker when fitted with this boiler. Two tests were made—one before fitting, and one after. The joint in both cases was the same—a 5 lb. leg of lamb. In the second test, the joint was cooked and 1½ gallons of water heated to a temperature of 140° with less gas than in the previous test, though the cook—who has had large experience—was sure that her heat was just the same.

Naturally, the quantity of water heated varies with the size of the oven and the joint cooked. In a large cooker tested (Davis No. 11), during the time allowed for cooking a 10 to 12 lb. joint, 6 gallons of water were raised to a temperature of 165°, with an increase of only 3·7 cubic feet of gas over the amount consumed without water heating—showing a saving of 16·3 cubic feet for one cooking only, as heating this amount afterwards by means of kettles would require about 20 cubic feet. In large restaurants, where large cookers are in almost constant use, the importance of this arrangement cannot be over-estimated; and yet it is by the wife who does her own cooking, or carefully supervises it, that the idea of the saving will be most appreciated.

I think anyone will acknowledge that, in bringing this idea to the public notice, the Gaslight and Coke Company are again proving to their consumers, in yet another small way, that they are at all times willing to assist them in gas economy. We want them to burn gas, certainly, but also to burn it in such a manner that they are thoroughly satisfied that they are getting full value for their money.

Some comments in the "JOURNAL OF GAS LIGHTING" a short time back on various systems of similar water heating arrangements require dealing with. Questions were asked which I will now try to answer.

"Would not pastry baking be affected if the hot water were drawn off and replaced with cold?" Even if this were so, I do not think it is a serious matter, as the hot water would be used for washing up after the cooking not during the baking period. However, I tried this experiment by temperature test, and found that the drop was only from 450° to 445° for about 15 minutes; and the temperature then returned to the former point.

I attribute the smallness of the fall to the fact that, as only a ½-inch wrought-iron pipe was used in the oven, the volume of cold water is so small compared with the oven volume as to have only a very slight effect. With the browning-shelf in position, the drop was practically *nil*.

"Would not this cause condensation; and, if so, might not the vapour affect the pastry?" There was no condensation with the wrought-iron pipe; and this, I believe, is due to the thickness of the iron, which acts as a baffle between the cold water and the hot gases. With copper pipes there is condensation for a moment. I cannot see that the vapour from this would affect pastry, as it would be above the browning-shelf, and pass away through the flue. I have found no advantage through using copper pipe; the results from a ¾-inch copper and ½-inch wrought-iron pipe being just about the same—showing that the heating is due not so much to the volume of water in the oven as to the external surface of the pipe. Also with copper pipe the question of verdigris would have to be considered.

"If wrought-iron pipe is used, might not rust drop into the food?" From my experience, the condensation on first lighting-up is little (if any) more than you find all over the other iron surface (provided you do not put too large a coil in the oven) on opening the door a few minutes after lighting-up; and by the time you are ready, and put your joint in, it has all disappeared.

An advantage of this type of water-heater is the fact that a small quantity—say half-a-gallon—can be heated while cooking a small amount of pastry, sufficient in the majority of cases for washing-up the utensils used. Economy cannot be obtained without good management. I think we can now say with safety that this arrangement makes the gas-cooker—already the very essence of utility—complete in every sense.

The Larkin "Surprise" Boiler attached to a Gas-Heating Stove.

Having obtained such good results from the cooker, a gas-fire was then experimented with; and the amount of heat which can be retained from what would otherwise be a small quantity of waste gases certainly is remarkable. Two different types were experimented with. In the Wright's 14-inch "Arch Druid" fire, a coil was fitted under the canopy, and the tank made separate from the fire-casting. This gives a rapid haeting result from the coil for small quantities of water. But, of course, the fitting of the coil is an additional expense; and it is found when the tank is cast direct on the top of the fire—as in the Richmond or Davis—there is not much advantage in the addition of the coil after the fire has been alight about an hour. Even if allowed to get dry, and cold water is put in, the casting does not get hot enough to crack through contraction if properly designed. The best results are obtained with these boilers by keeping the tank fairly full, and re-filling as the water is drawn off, as by this means the whole of the heating surface is taken advantage of.

You will find them very handy in bedrooms, especially in cases of sickness, or in the children's nursery, where a little hot water is so often required. Very often in cold weather in small houses or flats, where no maid is kept, whether a gas-stove or kitchener is used to cook the midday meal, hot water is wanted for washing-up tea things and for other domestic purposes. With one of these fires in use in the dining room or sitting room, the fire, which has to be alight to warm the room, is also providing you with hot water, without additional gas consumption. Also it retains in the room, in the shape of hot water, a certain amount of heat, which would otherwise have passed up the chimney.

In a 14-inch fire, it is possible to get a tank to hold about 1 gallon of water; and, with the gas full on, this quantity can be raised to a temperature of 140° Fahr. in 1½ hours, and 1 quart drawn off every 20 minutes at this temperature. With the gas full on for the first half hour, and then reduced to "half on," the 1 gallon would get to 120° in 1½ hours, and a quart could be drawn every 40 minutes when the temperature of 140° has been reached. A 10-inch fire holds about 3 quarts, and heats-up in just about the same time. Provision is made for a steam-vent into the flue, in cases of boiling.

In both the cooker and the fire the idea is not so much to boil water as to heat it sufficiently for domestic purposes. It does boil, however, in a number of instances. Hence the necessity for providing a vent in the case of the fire. In some cases of illness a moist atmosphere is required; and this is easily obtained by removing the top, when the room can be saturated to any desired degree.

I need hardly say that extensive experiment, such as I have described, could not have been carried out without the hearty approval and encouragement of my superior officers in the Company, to whom, and to others who have assisted me in several ways, I wish to acknowledge myself indebted.

Interest in the paper was added to by the showing in action of a Richmond No. 60 cooker, with the Larkin boiler; a Richmond "Horseferry" cooker, with alterations as described; a Wright 14-inch "Druid" gas-fire, with the Larkin coil; and a Davis "Minerva" fire, without the coil.

DISCUSSION.

The PRESIDENT (Mr. S. A. Carpenter, of the North Middlesex Gas Company) remarked that the subject was one in which there was room for a good deal of difference of opinion. There were many stoves; and each maker naturally thought his own was the best. All had good points; and the difficulty was to know which stove had embodied in it the greatest number of these good points. The advantage of Mr. Larkin dealing with the question was that he handled practically all makes of stoves, and so was in a position to tell them about the features which his experience led him to think should be embraced in the ideal stove which they all desired. It was obvious that Mr. Larkin had given much attention to the subject-matter.

Mr. W. L. WESTBROOK (North Middlesex Gas Company) expressed his appreciation of Mr. Larkin's interesting and instructive paper, the amount of time and trouble involved in the experiments made, the useful comparisons of consumptions with the different types of crowns, and the proportioning of flue areas to the cubic contents of ovens. The question of smothering-out of burners was a very important point; and the experiments and the suggestions of Mr. Larkin provided food for much thought, and would undoubtedly lead to modifications in construction that would increase the efficiency, safety, and usefulness of the gas-cooker. If he might venture an opinion, Recommendation No. 4 was of vital importance; the lowering of the burners and the provision of adequate air space at the base of the oven enabling the descending spent gases (if unable to pass away by the flue) to find an outlet, before extinguishing the burner flames. This point was forced on his own notice only a few days ago. On examining a consumer's cooker, he discovered they had connected a flue-pipe from the oven directly outside, and carried it up 6 or 8 feet, with an elbow at the bottom. He promptly condemned this as dangerous, and asked leave to test the oven. It chanced to be a windy night, and after the oven had been on about ten minutes, though there was a tendency to smother, matters were not so bad as he had anticipated. He went outside, and found the flue-pipe at the elbow, about 20 inches from the cooker-nozzle, quite cold; and the worst that happened was that two or three jets on the right-hand burner were extinguished. As he had expected at least the whole of one side to be put out, he looked for the cause, and at once noticed that the air space at the base of the oven was much greater than the average make, and in this case had probably prevented trouble. He wished to join issue with Mr. Larkin on one or two points; but he could not claim to be the expert on the subject that the author undoubtedly was. First, Mr. Larkin's remarks regarding the velocity of the mixture in burners of ¾ and ⅜ inch bores seemed somewhat contradictory. He stated: "With the same volume of gas passing through a burner of ⅜-inch bore, the flame was stronger and sharper, seeming as if the velocity of the mixture was maintained right up to the point of ignition, due to the greater resistance." It appeared to him (the speaker) to be more logical to expect the velocity to be checked by a greater resistance rather than maintained, as was the case in air-adjusters on lamps and lighting burners. He suggested that it was faulty construction to have the same size and number of jets and the same sized injector, passing the same volume through burners of ⅜ and ¾ inch bores, and that the cause of the sluggish flame on the ¾-inch bore burner was due to such proportioning. His experience had been that a ¾-inch bore burner, with correctly proportioned jets and injector, gave a better aërated flame than the smaller bores. The vital point, of course, was that before a burner could be correctly proportioned, the specific gravity and composition of the gas, and the pressure at the injector, must be known. He had known many cases of burners with an adequate air inlet giving a sluggish white-tipped flame, owing to the nipples being too small to pass the volume of the mixture. The result of this was that a back-pressure and return current were set up; it being often possible to ignite the return current of escaping gas several inches behind the injector. The complaint was quite common where jets of cooker burners were allowed to become corroded-up through boiling over. He would like to ask Mr. Larkin what he (Mr. Westbrook) considered two vital questions. In his tests and proportioning of flues to cubic contents of ovens, the results of which had led him to advise a reduction in flue area, were these tests carried out with new or clean cookers, or with cookers that had been in constant use for (say) two years on the district, a big percentage of which would be found to have some grease on the enamelled linings, and probably 10 per cent. a liberal coating? If the tests were made on clean cookers, what percentage increase in flue area had Mr. Larkin allowed as a margin of safety to deal with the greasy vapours that in many cases would have to be dealt with by the flue, in addition to the products of combustion, when his cooker had been on the district for the time mentioned? He himself had experienced so much trouble with small flue-outlets, both on cookers and fires, that he felt that in starting out to reduce the flue areas it would be wise to "make haste slowly." Further, in fixing a minimum flue area, would Mr. Larkin allow any margin for subsequent increased consumption, due to a higher pressure or lower specific gravity of the gas, or to a complaint fitter enlarging the injectors? Did Mr. Larkin claim that the suggested improvement in the position of the oven burners would successfully deal with the points mentioned, or that a minimum flue area could be fixed without allowing a margin for safety? He was open to conversion, but for similar reasons to those stated he did not like dampers or adjusters on flues. Then he was "up against" Mr. Larkin again over cooker explosions. He was not prepared to argue the point as to whether the escaping gas from one burner could be exploded by the flame from the other, not having made any experiments in this direction; and he agreed that in nearly every case the ignition was from a burner on the hot plate. He well remembered witnessing a case where the person who opened the oven door was enveloped in a sheet of blue flame about 6 feet high, and got off practically unhurt. In some of the more violent cooker explosions the results of which he had witnessed, the escaping gas had undoubtedly been ignited from a hot-plate burner, but when the oven door was tightly closed and no one was near, most probably through the explosive mixture issuing through the flue nozzle, or possibly through other apertures in the oven or crown space. This was obvious in several cases, as the latches were burst off; and he remembered one large cooker being absolutely shattered to pieces. He had known several explosions on cookers with direct flue outlets caused by a collection of fluff on the outlet nozzle and the wall opposite, made to adhere by greasy vapours; and he had a rule to allow a minimum distance of 2½ to 3 inches between the flue and the wall.

Mr. D. J. WINSLOW (Lea Bridge) remarked that the author had touched on a very big subject indeed. So far as he himself knew, very little attention had been paid to radical improvements in the gas-cooker, though in the past few years such improvements had been brought about in the gas-fire. The time had now arrived for proper scientific research in connection with cookers, so that, if possible, greater efficiency might be obtained from the gas used. In comparison with electricity, gas had already a great margin to the good; but there was no reason why they should not try to increase it. Makers had not given the attention they might have done to the matter. There were to be found all sorts of flues and burners; and the varying results achieved from different cookers were surprising. With reference to the remarks made as to the size of bore for oven burners, he did not know whether Mr. Larkin had tried to get a greater velocity out of his jets by reducing their number, and so getting longer flames. This, it seemed, would be a better procedure, as there would be a larger burner, which would be less liable to get stopped up. The author made the statement that, if the flue was just the correct size to pass the gases from the open crown at 400°, when there was a conversion to the packed type the area of the flue was not large enough by about 10 per cent. to pass away the same quantity at a temperature of 450°, as it had a larger volume—hence the smothering of the burner. He would like to suggest that, the temperature of the products varying so, undoubtedly there was a difference in the specific gravity of these products, which might counteract the effect of the larger volume. Certainly, the time had come when the cooker should be designed on more scientific lines. He could not see why they should be obliged to have the big open space round the bottom. It ought to be possible to reduce this in some way. Of course, it had to be considered that the arrangement must be made fool-proof, so that it should not become a source of danger; but some different way might be devised to introduce the secondary air required for combustion at the burners. In the ordinary open cooker, it appeared to him—it was only an opinion—that the air which went in at the bottom at once did its best to get out at the top. With these conditions set up, one was likely to get directly through the centre of the cooker a stream of air containing a certain amount of oxygen, which one ought to be able to use to aid complete combustion at the burners, and thus prevent smothering. Part of the air went to support combustion; but undoubtedly the greater part simply went and helped to swell the gases inside the cooker. One had a very large amount of air and burnt gases in the cooker, which were not able to get out, and so there resulted the smothering action. Had Mr. Larkin tried a properly

controlled secondary air supply directly on to the burners? The proper way to tackle the smothering trouble would be by making some tests to ascertain the effect of introducing air in this way, Smothering, of course, arose under various conditions. In one position in a scullery or kitchen a cooker would be found to work properly, whereas in another position it would smother. The explanation of this was the draught on the floor. In oven burners where the jets were very close together, there was more likely to be smothering than where they were some considerable distance apart. The foreman at his place had told him of a cooker in which the jets were close together, and there was smothering; so he shut off every alternate hole in the burner, and got absolutely no smothering—implying that the air was able to get all the way round each of the jets, and so there was a sufficient supply for complete combustion. Of course, the gas consumption was the same, because he did not alter the nipple. One question he would like to ask the author was whether he had carried out his tests under working conditions. They had ovens to put joints and pies in, and when this was done there was a lot of steam generated, which must have an effect on the flue capacity, because of the extra volume of vapour. They were all very glad to see that Mr. Larkin had stuck to the problem of water heating. Of course, it was necessary to consider the initial outlay on the apparatus, and the cost of maintenance. Again, it was the custom to cook the joint in the gas-oven, then have dinner, and afterwards wash-up. Would the heated water have got cool again by the time one was ready to wash-up the things? Lastly, had the author in any way worked out the efficiency of this boiler with the cooker? Probably he could not say how many thermal units were required to cook a certain joint; but could he give them any figures of the value in B.Th.U. of the heat in the tank.

Mr. W. J. Sandeman (Croydon) remarked that the paper had presented him with a lot of food for thought. He was very much surprised to hear the author say there was such a difference between open and packed crowns. To get over the trouble of smothering with cookers that were supplied at Croydon, they had adopted simply an enamel plate, which slid in and out. He was somewhat astonished to learn now that there must in consequence be a considerable difference in the efficiency of the oven. He had not thought there was; but he would test the matter.

Mr. W. E. Brown (Gaslight and Coke Company) pointed out that Mr. Larkin had said that he had put bricks in the oven to represent joints. There was not only a considerable amount of space taken up by joints and pies, but there was the discharge of steam, which had to be reckoned for in the ventilation. Another point was that many customers used tins which fitted the cookers "like a glove." There were makes with which, no matter what sized tin was put in, one could not completely close the whole area of the oven; but there were other cases in which it could be done. The author said the flame, which had been perfect with the open crown, as in figs. 1, 2, 4, and 5, immediately smothered when the crown was altered to figs. 3 and 6, though the same sized flue was used. He (the speaker) could not quite follow why this should be. It would seem that figs. 3 and 6 ought to have smothered much less. Modern cookers were provided with adjustable burners, to meet the question of pressure; but for the sake of economy, it was advisable to have a governor under certain circumstances. He had tried various types. As there was a pressure of from 5 to 6 inches, it was desirable to have one. His stove was designed, no doubt, for a pressure of 1 or 1¼ inches; and it would be unwise to put it under a pressure of 5 inches with nothing but the ordinary tap, for people would not take the trouble to regulate with a tap as they should do. There was another point which at first sight was not quite clear. It was understood that when gas was burnt the products of combustion would occupy less space than the gas and air consumed; but Mr. Larkin referred to products not being able to pass away because of their volume. Of course, there was the alteration in temperature; but he would not have thought it made all this difference. In the case of fires, the water-coil was placed under the canopy. Had the author tested the ventilating properties of the fire under these conditions? Now makers were very particular about the shapes of their canopies; and the coil inside might upset their calculations, and mean that the products would not be going as they should do up the flue.

Mr. Winslow asked if the author had tested the products of combustion from the outlet of the cooker, to ascertain whether there was any free oxygen, through allowing too large a body of air into the bottom of the cookers.

Mr. S. B. Chandler (South Suburban Gas Company) said Mr. Winslow had spoken of the efficiency in B.Th.U. of the heat put into the water by Mr. Larkin's device. Mr. Larkin said in his paper that only about 2 cubic feet of extra gas was used in the oven in actual test to heat 1½ gallons of water to a temperature of 150° Fahr. Taking the original temperature of the water at 60°, and raising it with gas of 550 B.Th.U., this appeared to yield a result of about 90 per cent. efficiency.

Mr. J. Hewett (South Metropolitan Gas Company) said he was going to ask the same question as Mr. Winslow—not, however, in relation to free oxygen, but as to whether the presence of carbon monoxide had been detected. Most cookers were placed in small apartments; and when the flues discharged direct into the air of the room, it was important to see that the products of combustion were harmless. As to outlet flues, the author suggested that the cooker would not be complete until the flue-vent was operated by the gas-tap. This was a thoroughly good suggestion. To his own mind, the whole thing turned on the human element—the insufficient amount of education that the consumer had. It was the duty of gas undertakings to instruct consumers in the use of apparatus; and introducing improvements would not be of much use unless consumers knew how to take advantage of them.

Mr. A. Broadbent (Gaslight and Coke Company) remarked that if they provided a damper, and made certain that it would not close entirely, surely this was fool-proof in itself. The idea seemed to him to be an excellent one; and he believed that for several years it had been used by some people.

Mr. D. C. Cross (Lea Bridge), referring to the suggestion for cutting-down the secondary air to prevent excess of oxygen, asked what would be the effect on the joint if the supply was so regulated that there was perfect combustion and no oxygen wasted—only the bare products of combustion passing away.

Mr. F. Ainsworth (Ilford) expressed agreement with the author on many points. One thing, however, of which he was not much in favour was the reduction of the flue outlet. It was necessary to be very careful about this. For many years, when going round the district, he had carried a small mirror in his pocket; and when examining a cooker as to which there had been complaint, he would make sure that it was burning properly. If those who had not adopted this course would do so, they would gain valuable experience. The positions in which cookers were placed, and the conditions they had to be worked under, too often led to smothering. In his district, they were mostly fixed in small sculleries; and when they were placed in the corners, things were still worse. The different makers were endeavouring to reduce the flue, in order to get the best results; and this was a matter to keep in view. His opinion was that an explosion did not occur when only one side of the oven had gone out. His experience had been that an explosion was caused by one of the burners being lighted on top. On another point, it had to be admitted that there was some difficulty in regard to getting the height of cooker flames as it should be. In nineteen cases out of twenty, when the gas failed, whether by firing-back or smothering-out, people would turn on as big a supply as they could. His Company had adopted a plan of sending a man round after a cooker had been fixed, to see that it was burning all right; and he found the flames were apt to get long. In many cases he had to knock-up the nipples and lessen the holes. But, of course, this must not be done too much. He did not think that generally gas was allowed to burn fifteen minutes before using the oven. The boiler for the cooker was a very good idea; but it seemed to him that the arrangement must impede the velocity of the products of combustion going out. As to gas-fires, they must remember that the first thing they had to do was to get the flue heated to such an extent that it would carry away the products; and makers now were making provision for a large outlet for this purpose. The price of Mr. Larkin's arrangement at present was rather against it; but no doubt the cost could be reduced considerably, because it was very simple.

Mr. Westbrook, on the point of experience with a control for the flue, said he had had a small acquaintance with such an arrangement, and had trouble with smothering. He did not say this trouble was altogether due to the damper. It might have been owing to other constructional features. There were adjusters to the nipples in addition.

Mr. W. A. Vanner (Walton-on-Thames) asked the author if he had tried these cookers attached to a flue-pipe, instead of having the outlet open to the atmosphere. With a flue-pipe a less diameter flue would suffice than when unattached, because the pull of the chimney would be equivalent to the larger area of flue. Were the Gaslight and Coke Company prepared to alter their cookers in accordance with the author's suggestion? As to the cookers with packed crowns, he did not gather whether the sides also were packed. A difference in consumption might be anticipated between packed and unpacked sides; for it was obvious that packed ovens saved something. Was it claimed that heating water in the way suggested was novel? He remembered some years ago a stove with water receptacles on the crown plate and hot plate; but it proved expensive.

The President said he thought the reason why more attention had been devoted to the development of the gas-fire than of the cooker was that the cooker rapidly achieved popularity, and there was such a demand for it that the need for improvement did not appear. There were, however, some directions in which improvement might be made. Take the grill, for which they had a long straight burner, with a row of jets on each side. If a piece of bread was placed under a grill of this description, with the idea of toasting it, the bad effect of the arrangement was clearly shown. The ends were nicely browned; but in the middle there was a broad white strip where the bread had come under the burner. He had seen it stated that it was an accepted thing in English practice that the efficiency of the boiling-ring was about 50 per cent. of the calorific value of the gas consumed. This was a very poor result; and he thought the reason was purely on account of the fact that in many makes of stove the top bars ran straight across without a break, and the flame thus came in contact with the bars. This led to incomplete combustion; and the passing of heat from the burner to the vessel was impeded, while a lot of heat was absorbed by the bars. In some patterns the bars were trimmed round the burners; and this might be expected to give a much higher efficiency. Enamelled top plates were sometimes turned up at the edges, but not soldered at the corners; and so the liquid trickled through just the same. Gas-fires, of course, had made great strides in all respects. As to the boiler fitted in gas-fires, it seemed to him that a rather serious objection was the

risk of the tank becoming leaky, and allowing the water to be discharged into the fuel. Also, he was astonished that the author should advocate so small a size as ½-inch pipe for the coil in the cooking stove. In districts where the water was hard, this would quickly fur-up, and might give a lot of trouble.

Mr. LARKIN then dealt briefly with the points raised in the discussion. He said that in the majority of cookers on the market now, when the flue was reduced one immediately got smothering of the burner; and it would be only when the burners were put in a proper position that this would be overcome. When once the burner was so placed that it was difficult to smother-out, then they could begin to reduce the flue. As to Mr. Westbrook's point about the velocity of gas, perhaps they both meant the same thing, but had put it differently. When the gas was going through a ¾-inch burner, the velocity of the mixture due to the gas carrying the air in was lost; whereas with the smaller burner it had to drive itself through, and force itself out through the smaller sized hole. As to explosions, these would sometimes take place through a badly fitted door. With regard to Mr. Winslow's remarks, specific gravity might affect the matter; but he did not know that it would do so very much. Certainly, there was a far too rapid rush through the cooker, and this was why he was recommending a smaller flue. The supply of secondary air was very difficult to regulate. There must be a little air underneath the cooker. He reckoned that during the three quarters of an hour which ordinary people took over dinner, the temperature of the water in the boiler would drop about 10°. Referring to the difference between packed and unpacked crowns, he thought Mr. Sandeman had misunderstood him. The comparison was after the flues had been reduced; and it was stated that the packed crown had only a small advantage. The bricks placed in the oven were wet. The moisture in four bricks soaked over-night would be just about the same as would be got out of a joint. Tins that fitted so tightly in stoves that they were a trouble to get in and out should be condemned at once, as they were a great source of danger. As to the placing of the coil in the canopy, it did, on first lighting, to a very small extent, affect the products; but the fires exhibited had had to pass the standard tests. Mr. Chandler had spoken of an efficiency of 90 per cent. He did not claim this for a moment. Heat for the boiler was obtained to a great extent from the preparatory heat put into the cooker on warming-up. He had no tests which would enable him to answer the question as to the carbon monoxide. With regard to Mr. Cross's remark about perfect combustion, he thought the joint might be a little flavoured. In reply to Mr. Ainsworth, he would repeat that he did not suggest that flues should be reduced with the burners in their present general position. The burners as in fig. 7 they were told were regenerative; but they were not on the regenerative principle at all. As to the oven being lighted before cooking, from ten to fifteen minutes was, he believed, the generally accepted time, especially for pastry baking. He had hopes that the cost of the water-heating apparatus would become less. The cookers he had shown tests of were packed all round, not only on the crown. His proposal was not so much for altering existing cookers as for suggesting the lines on which makers might with advantage consider the question in constructing new ones. His idea was that in the laboratory there was not so much of a saving to be shown by the use of his apparatus; but in the house nobody would notice the few feet of gas it used. There had been a number of attempts to heat water from the oven; and he did not claim that the idea was fresh. In his arrangement, however, the coil was taken round the top of the cooker, so that the hot gases reached it after they had passed the article being cooked; and the construction was on the most simple lines.

Mr. CHANDLER, in proposing a vote of thanks to the author, pointed out that just lately one or two cookers had come on the market which were a decided step in the right direction.

Mr. BROWN seconded the vote, which was heartily accorded; and the proceedings teminated.

AUTOMATIC AND DISTANCE LIGHTERS.

A paper on the subject of the automatic and distance ignition of gas was submitted to the members of the American Gas Institute, at their last annual meeting, by Mr. FRANCIS H. GILPIN, of the Photometrical Laboratory of the United Gas Improvement Company.

In his introductory remarks, the author pointed out that the problem of finding some suitable means for the ignition of a gas-lamp, either of the open flame or incandescent mantle type, had long been in evidence. In view of the fact of electricity being controllable from any location by a simple switch, the need for a distance and automatic control of ignition for gas had become almost a necessity. The earliest attempts to obtain auto-ignition naturally inclined towards some scheme where a substance would of its own properties cause ignition of the flame—as platinum black. Owing, however, to the deterioration of such substances of this type as are now available, whether from evaporation, fusion due to heat, or moisture absorption, the results obtained have not been entirely satisfactory. The introduction of the incandescent mantle burner and bye-pass cock and pilot gave the first directional impulse towards a satisfactory solution of the problem.

The first attempt at outdoor distance lighting was made in 1850 by Professor Klinkelfuss, at Göttingen; but it does not appear to have been successful. Since 1878, the solution of the problem has been more generally attempted; and in some cases very satisfactory results have been obtained. Several systems and means have been adopted so as to reach the desired end. These may be classified as follows: (1) Pyrophoric. (2) Catalytic. (3) Electric. (4) Pneumatic. (5) Pressure-wave. (6) Pressure-wave and clockwork. (7) Clockwork.

The author proceeded to deal with each of these systems successively; taking first those employed in indoor lighting. He described and illustrated a pyrophoric lighter, the D'Arsi autoflame and Lyon hot-wire igniters, the magnetic clock, the Luther pneumatic valve, and the Askania igniter. Coming to outdoor lighting, clockwork systems were first considered, and were illustrated by the Horstmann, Shaw (automatic), and "Rapid" lighters. The pressure-wave lighters described were the "Bamag," Tourtel-Mealing, Broadberry, "Gafeg," and Lux; while the combination of pressure-wave and clock was shown in the Kilchmann-Gaulis and Robson automaton lighters.

CONSTRUCTION AND OPERATION OF LIGHTERS.

Mr. Gilpin then offered some criticisms on the construction and operation of lighters. As to their vital and weak points, he stated that all the ills to which any piece of machinery or apparatus in contact with gas is heir seem to be intensified in the automatic lighter. Troubles which seem minor elsewhere appear to be flaring defects in an ignition device or an automatic controller. The points which should be considered in a criticism of these appliances were, he said, the ignition device, the cock or valve, the source of power, and the operating mechanism. He proceeded to make the following remarks on the points mentioned.

The ignition device may or may not be a vital feature of the apparatus. In pyrophoric or catalytic lighters, it is the main feature. For the remaining types, it is not, as a rule, a prominent feature, especially where pilots are used. Pyrophoric igniters are subject to heat, cold, and moisture. When wet or cold, their operation is slow and imperfect, and in some cases operation is impossible. Heat increases their activity. One of the chief disadvantages of their use is that the active material wears out and must be replaced; the amount of use governing the length of time of service.

Catalytic lighters have many virtues, and, *vice versâ*, many faults. When platinum or palladium black is used, the same troubles are encountered as with the pyrophoric alloy, with the additional ones of fusion and evaporation. The active life of this material is apparently not long, and its action not instantaneous, as from 6 to 15 seconds are required, on an average, from the first gas admission to ignition. With the electro-catalytic platinum wire type the situation is different. The deterioration disadvantage is shifted from the ignition device to the source of power—the electric battery. As, in order to avoid burning-out the fine wire, the electrical balance is very carefully established, the life of the battery determines the continuous operation of the apparatus. Cells can be obtained that show a life of more than a year; while the igniters proper will stand upwards of 60,000 ignitions. Corrosion of contacts is a great source of trouble; and all such points should be located where they can be easily cleaned.

Pilot troubles cannot be charged directly against a lighter, unless the cock or valve used governs the action of the pilot. In the case of the feature where the pilot is extinguished on ignition of the main burner, the action of the valve is very often so quick that the first is extinguished before the second is ignited. Pilots placed inside the mantle give greater satisfaction than outside pilots, though this type must be non-luminous, or mantles will carbonize. Where the pilot has a plug-cock adjustment instead of a needle, the tendency for drip to collect, and, by freezing, stop the gas-way in cold weather, is greatly increased. Cylindrical plug-cocks wear down; and as wear cannot be taken up, leaks will occur. In the tapered-plug type, where provision is made for automatically taking up the wear, the friction gradually increases, and the torque necessary to operate is consequently increased. Lubrication of plug-cocks, especially outdoors, is quite a problem. In cold weather the drip, even in the small quantities that form, will in about a month or six weeks dissolve almost any lubricant used, leaving the cocks dry and tight. Indoors this action requires five or six months to cause trouble. Piston valves require some type of packing, and in two or three years will develop a permanent leak. Cone, plug, and ball valves are liable to become corroded and coated so that they do not seat properly. If they seat from their weight alone, small foreign particles are liable to cause leakage by creating an eccentric action. Flap-valves require greater care in workmanship to ensure tightness; but if well made, their action is good, especially if the valve-face is vertical. Rotary disc-valves are probably the best type to use, as the wearing surface is constantly self-cleaning, and requires little or no lubrication.

In pressure-wave lighters, the life of the diaphragm is of the utmost importance. Their tendency to harden is remarkable. If the material be of poor grade, diaphragms are liable to almost totally disintegrate before any serious trouble is noted; while where a superior grade of diaphragm material is used, suitable means can be provided for lubricating with a neutral oil. Small diaphragms seem more subject to difficulties than large ones, especially if in continuous contact with live gas pressure.

Clockwork should be as simple as possible, and separate means should be provided for driving the timing and operating trains. A

very important feature should be a definite relation between the tripping mechanism and the clock face, to facilitate adjustment in use. All parts that are liable to screw up and bind should be guarded against. The operating mechanism should contain the minimum number of bearings possible, and be positive in action.

General Summary and Conclusions.

The choice of the type of distance lighter depends almost entirely on local conditions. Where the system is greatly spread out and the location of lamps scattered, the use of clock lighters would probably be most satisfactory; while for more or less congested districts the pressure-wave system is more in order. The combination of pressure-wave and clock in one apparatus merely complicates the adjustment and the attention required of each type, though where the pressure of the gas is low, it could be used to advantage on a pressure-wave system. Clock lighters are more subject to weather conditions than the pressure-wave type, and when out of order more difficult to adjust and repair. They are independent of pressure conditions; but when once set to operate at a specified time, they cannot be controlled from a distance in case of emergency.

In the problem of the transmission of pressures to actuate pressure-wave distance lighters, it has been found that a 4-10ths inch wave will travel about 400 feet per second in a 30-inch main, and 350 feet per second in a 4-inch main. In all problems of this type, it is necessary to have a complete pressure control of the entire district from one point. Waves emanating from sources such as outlying or separate holder stations could easily follow each other at such intervals as to annul the effects of the previous wave. Where the entire distribution system is fed from a number of scattered holders, it would be necessary to confine the range of each holder to an isolated district, if pressure-wave lighters were used. These lighters, to be satisfactory, should be small, self-contained, and selective in their action. Barrel cocks, especially those of taper construction, are liable to stick, and require considerably more force to turn than can be obtained from the action of a small diaphragm, or even by clockwork.

When one considers that from a 3-inch diaphragm with a 4-inch water pressure the total available force is only 16·5 oz., or about 1 lb., acting on a very short leverage, it is readily seen how an only ordinarily tight plug-cock would prevent proper operation. One solution of this lies in the use of one of the numerous types of cocks in which friction is more or less negligible. Another is the use of higher pressures in the distribution mains, under which conditions also the slight increase in pressure necessary to start operating mechanism would be a smaller percentage of the whole.

Various types of cocks or valves are available which are not only tight but afford little friction in their movement. Mercury seals should be avoided, owing to their corrosive action. All evaporative seals cause more or less trouble if not regularly inspected. All operative parts should, as far as possible, be removed from contact with the gas, as it generally causes corrosion. The action of the apparatus should be selective, should respond to only a certain type of impressed wave, and should not be affected by gradual rise or fall in pressure due to normal operating conditions. The ideal perfect gas-lighter should have almost human intelligence, and turn itself on and off at a certain predetermined minimum intensity of illumination.

In spite of all the handicaps inherent to the problem of automatic and distance ignition, considerable success has been obtained in England and Germany with both clock and pressure-wave systems in addition to the financial profit incident to their installation in the saving of gas and labour charges.

USE OF FERTILIZERS IN THE UNITED STATES.

Value of Sulphate of Ammonia.

It was mentioned in the "Journal" last week that, at the recent International Meeting of Sulphate of Ammonia Manufacturers, Mr. W. H. M'Ilravy, of the American Coal Products Company of New York, read a paper in which he dealt with the fertilizer and sulphate of ammonia business in America. The following are some extracts from the paper.

Fertilizer Consumption in the United States.

The present production of sulphate of ammonia is central, approximately on a line between Chicago and New York; and the future development, except for the Alabama district, will probably concentrate near Chicago or along the Lake shores. This may eventually prove to be a fortunate location, when the great grain-raising districts of the North-West begin to call for soluble nitrogen; but at present, with the consumption so largely concentrated in the Southern Atlantic and Gulf States, to which the foreign shippers of sulphate and nitrate have access on almost equal terms, it is a decided handicap to the home producer. The statement is current in the fertilizer trade that 90 per cent. of the fertilizer is used south of the Pennsylvania and Maryland border, and that 90 per cent. of this quantity is used east of Allegheny Mountains. Some years ago this was probably an accurate statement; but the advance in fertilizer consumption made by Alabama and Mississippi, together with that in New York, Pennsylvania, and Ohio, has altered the proportions somewhat, so that 70 and 75 per cent. are now nearer the truth. The statement, however, shows the direction in which progress has been made. If we make our division on the line of cotton production, we find that 65 per cent. of the fertilizer is used in the cotton States. The centre of cotton production lies near the joining of the Arkansas, Louisiana, and Mississippi border lines, it having moved west half-way across the latter State since last year, due to the record crop made in Texas.

The year 1912 was not a good one for the consumption of fertilizers. As the actual figures of total fertilizer consumption may not have been presented, I will give them as follows: Year 1911, 6,669,826 tons; 1912, 6,382,405 tons—that is for 49 States. According to these figures, the total consumption in 1912 was less by some 287,000 tons than that of 1911. In other words, a 4 per cent. decrease appeared, where the experience of the past three years justified us in looking for an increase of 10 or 15 per cent. The total decrease in eleven States amounted to 464,900 tons; but increases in the other States of the Union so far neutralized this decrease as to render the total decrease of the country but 287,000 tons. Of these eleven States, all but three—Ohio, Maryland, and Indiana—are cotton producers; though, of course, in Missouri cotton is not the dominating crop. In point of actual volume, also, the cotton States lost 404,000 tons, while the northern States lost 60,000 tons. It is therefore clear that it is to the cotton States that we must look to account for the lessened consumption, and there also for the means of recovering lost ground. In the cotton States, the cotton crop is the money crop, and it is, generally speaking, the one that receives the fertilizer. A decrease in cotton planting usually means a decrease in fertilizer requirements.

Ammonia Production.

The production of ammonia, which had not increased much for a few years, took a sudden advance last year, and 38,000 tons were added to the annual output, where but 10,000 or 12,000 had been the rule. This was due primarily to the increased number of bye-product coke-ovens which had come into operation, but also to a certain extent to the increase in the use of coal gas, and the large recovery of ammonia from this industry. The advance in bye-product coke-oven construction had long been expected; and the only reason for surprise has been that it came so slowly. In 1900 the proportion of bye-product coke to total coke made was but 5 per cent.; in 1905, it was 11 per cent.; in 1912, 25 per cent.; and in 1914 it is probable that it will be 35 per cent. of the total, through the operation of plants now completed or in course of construction. This revival of bye-product oven construction is partly due to inherent merits and economies of the process, but also in part to an unexpected stiffening in the prices for beehive coke from the well known Connellsville district.

The tendency towards increase of production from the coke-oven is also supplemented by a similar movement on the part of the gas industry. Whereas some years ago the prospect was that the future additions to existing gas plants would all be for carburetted water gas, the reverse is now the case. The demand for motor gasoline has compelled the oil manufacturers to seek out means for increasing their available supply; and at the same time improvements in oil distillation have made it possible to recover more of the lighter hydrocarbon products from grades of crude oil hitherto used for gas oil. In consequence, the price of these gas oils used for carburetting water gas has been raised so high that the coal gas process has become the cheaper of the two. While there is no immediate prospect that the recovery of ammonia from coal gas will rival that produced in Great Britain from this source, we may expect a regular increase in our production for the next few years. Reckoning the increase from both coke-ovens and gas-works, we look forward to a production of 190,000 tons of sulphate equivalent in the current year—an increase of 25,000 tons over 1912.

Nitrate of Soda.

The importation of nitrate of soda into the United States for the last three years is given below.

Year.	Tons.
1910	428,429
1911	544,878
1912	486,352
1913 (first six months)	358,221

In 1913 the half-year's figures are the largest on record; but it is highly probable that part of this was bought because an increase in price was expected as a result of the proposed restriction of production. Accurate figures as to what proportion of the nitrate of soda imported goes into the soil as a fertilizer are difficult to arrive at; but the best-informed commercial houses put the amount at about 225,000 net tons, or (say) 46 per cent. of the total imports for the year 1912.

Use of Mixed Fertilizers.

In 1909 the census reports show that there were 550 manufacturers of fertilizers in the United States. The capital invested was $120,000,000. Since 1904, the number had increased by one-third and the investment by three-quarters. The business is in strong hands, and is moving forward aggressively. Nearly all this development has been in the manufacture of mixed fertilizers

—that is to say, compounds containing two, or more usually all three, of the plant-food elements—nitrogen, phosphoric acid, and potash. The purchase and use of mixed fertilizers is much more general than that of single fertilizer ingredients. Just what the proportion is, it is difficult to say; but in the State of Indiana, where accurate official reports are made, out of the 144,000 tons used in 1912, only 23,500 tons, or about 16 per cent., were separate ingredients. The majority of mixtures carry 2 per cent. of nitrogen. While the custom of a fixed analysis has some drawbacks, it has the advantage of allowing the manufacturer to vary the ingredients in his mixture according to the fluctuations of the fertilizer material market, always provided the ultimate analysis of the compound satisfies the legal requiremeuts. Thus he may substitute sulphate of ammonia for a part of the dried blood and tankage formerly used, without in any way changing the name of his brand, and without at all decreasing its actual worth as a fertilizer. One of the methods we have adopted of extending our present market is to push dried and ground sulphate of ammonia as a top dressing, and we are hopeful of obtaining results that will be of material assistance to the market in the near future. This field has for many years been the exclusive property of the nitrate of soda agency, who recognized their disadvantages in the mixed fertilizer trade, and have long advocated the use of home-mixed fertilizers and separate nitrogenous top dressings.

Agricultural Experiments.

During the past three years our agricultural experiments have been carried on from two branch offices, located in Athens (Georgia) and Medina (Ohio), as well as from New York. Both these offices are in charge of trained agriculturists, graduates of their State Agricultural Colleges, and they maintain close relations with the experimental stations and agricultural colleges in the adjoining States as well as their own. Experiments proceed in the usual way—fertilizers and lime being furnished free of charge. Personal supervision in laying out plots, applying the fertilizer, and weighing-up the yield is given wherever possible.

In the North, experiments have been made with the usual field crops—corn, wheat, oats, potatoes, timothy, sugar beets, sweet potatoes, tobacco, &c.; emphasis being laid on those that are money crops or are most profitable in the region in question. In the South, corn, oats, wheat, potatoes, and the other common crops, have been tried when opportunity presented itself. But the principal emphasis has been laid on cotton; and many most successful experiments have been carried out.

Through the co-operation of the Central Railroad of Georgia, one of the principal railroads in the State, a number of excellent experiments have been installed on their experimental farms, where the land is worked by the farmers themselves; the railroad agriculturist giving supervision, and guaranteeing the farmer against any loss. So far these farms have always shown a profit rather than any loss. During the first two years, the assumed formula for fertilizing cotton was 550 lbs. of 16 per cent. acid phosphate and 80 lbs. of muriate of potash, with 100, 200, or 300 lbs. of sulphate of ammonia per acre. As quite a number of the tests failed to show a satisfactory profit with the larger quantity, though practically every test did well with 100 lbs. per acre, we have modified our formula to 100, 150, and 200 lbs. of sulphate in this year's tests. This type of test has been very successful, and has elicited much favourable comment from the agricultural authorities, as well as from the experimenters themselves.

In order to determine what effect, if any, the use of sulphate had on the size of the cotton boll, 500 bolls were gathered from each plot of a test at Kennesaw, and weighed. It was found that, while it took 75 bolls from the check plot to make 1 lb. of lint, and 71 bolls from the acid phosphate and potash plot, the bolls from the sulphate of ammonia plot weighed 56 to the pound, or a gain in weight of nearly 60 per cent. between the phosphate and potash and the nitrogen and phosphate and potash plots.

Tests on Various Crops.

We have laid particular stress on obtaining experiments with sugar beet, as the outlook is good for the use of fertilizer in this direction, though it is as yet but little used. The beets are grown on comparatively new soil, and it is still able to raise fair crops without fertilizer. It is only a question of time, however, before the lands in the vicinity of the factories will require restoration of the food elements of which they have been deprived, and the good factories are preparing to meet the need for information by making extensive fertilizer tests on their soils. Some tests were carried out successfully in 1912, and gave good results both in weight and percentage of sugar in the sulphated plots. In making these tests, we use 200 lbs. of sulphate of ammonia and 200 lbs. of agricultural salt per acre, in accordance with the results of the experiments made by the Deutche Ammoniak Verkaufs-Vereinigung. So far this measure seems to give us good results, both in yield of beets and in percentage of sugar.

The United States Government has for some four years been carrying out a series of fertilization tests in a rotation, including corn and tobacco. Through our efforts, sulphate of ammonia was included in these tests, and some very encouraging results have been obtained with it, though, unfortunately for us, the data are not to be given out. Tobacco is a crop that makes a heavy demand on the soil, particularly for nitrogen; and it is generally grown where there is but little live stock, and hence little manure. Moreover, with manure there is always trouble with foreign weed seeds and added cost of cultivation. Nitrate of soda is objectionable, because it makes a leaf that is coarse and rank in quality, and thus grades low enough to more than off-set the gain in weight. Cotton-seed meal seems to lack in effectiveness, and is now too costly. Sulphate of ammonia appears to avoid all these difficulties, and usually produces a leaf of excellent grade.

Various other crops have been experimented with, usually when these crops are cultivated profitably. Among them are tomatoes, cabbages, onions, sweet potatoes, and melons, all of which show favourable results with sulphate of ammonia.

Under the direction of Mr. W. P. Kelley, formerly Chemist at the Indiana Agricultural Experiment Station, some very interesting tests with sulphate of ammonia on rice have been carried out at the Hawaii Experiment Station in Honolulu. These tests have been going on for three years, and, according to the bulletins, they show that sulphate of ammonia is the most economical form of nitrogen for rice culture; the yields from the plots treated with nitrate of soda having consistently fallen far short of those from the sulphate of ammonia plots. Unfortunately, the precise data of this series of tests have not yet been published, so the figures cannot be given. The facts, however, only confirm reports we have already received from Japanese sources as to the advantages of sulphate of ammonia on rice, which are reinforced by the growing Japanese importations of sulphate. The Hawaiian station, however, publishes reports as to the success of sulphate of ammonia on another of its food plants—viz., taro, from which poi—the principal food of the native islanders—is obtained. As is often the case with other crops, notably sugar beet, sulphate of ammonia excels nitrate of soda not so much in the actual weight of the crop, as in its quality. In this case nitrate leads in weight of taro bulbs; but in the amount of poi, the valuable product, sulphate of ammonia is clearly ahead—giving 74·6 per cent., as against 57·6 per cent. for nitrate.

PIPE SUBWAYS FOR CITY STREETS.

This was the subject of a paper recently read before the Liverpool Engineering Society by Mr. F. T. Aman. While admitting the difficulties to be overcome, the author strongly advocated the construction of subways for carrying the pipes and wires now laid beneath the surface of streets. He expressed the opinion that the very worst place to lay a pipe-line was under a road, as it was subjected to pressure, vibration, and settlement from heavy traffic. The danger from deterioration of gas-pipes so buried was exemplified at Coburg, where an explosion resulted in the death of a dozen persons. It was estimated that 100,000 openings were made in the streets of London in one year; while in Westminster alone the opening and repairing of the streets cost from £20,000 to £30,000 annually. A typical example of the network and complications below a busy thoroughfare was afforded by South John Street, Liverpool, where on the upper side of the street along the footway there were three lines of electric light mains, an 8-inch gas-main, a brick sewer with a 24-inch water-main on top, a hydraulic main, a telephone conduit, and a 24-inch and a 4-inch gas-main. Below all these, and running at right angles, were another large sewer and several branches from other pipes and wires, also at right angles.

It had been argued that where pipe subways were most required—viz., in existing streets—it would, under present conditions, be impossible to introduce them. The many vested interests and amount of compensation which would have to be met would render the scheme prohibitive, and owners whose property might be interfered with by the formation of a subway would also require compensation. The first question which always arose when subways were proposed was as to who should pay or contribute to the cost. The companies who would benefit would not; they also objected to pay rent for them, and preferred to open the street and reinstate the surface as occasion required.

The powers necessary to enable local authorities to construct subways would have to be authorized by Parliament, and provision made to meet the objections of the companies. Where the local authority was the owner of the gas, water, electric, and other services, the matter was much simplified; but where there were several interests to be considered, any scheme was rendered almost impracticable owing to the expenditure which would be involved as compensation, for which Parliament was not likely to make any grant. There did not seem to be any question but that the cost of construction should be borne by the local authority as a public utility, and, instead of charging the companies an annual rent, a lump sum contribution might be made, calculated on what the cost would have been to lay and maintain pipes in the street.

We have received the 1914 issue of G. F. Schaars' Kalender für das Gas-und Wasserfach, published by R. Oldenbourg, of Munich and Berlin. It has been compiled in its usual attractive style, and the text contains much that is useful and interesting to gas and water engineers.

The new Mayor of Ilkeston (Councillor J. A. Macdonald), who has taken a very prominent part in the work of the Gas Committee during a particularly troublesome time in this department of Corporation activity, has been elected as Chairman of the Committee; the office having been held by the late Alderman F. Beardsley, and afterwards by Alderman W. Tatham.

METROPOLITAN WATER BOARD.

Tenth Annual Report.

We have received from the Clerk to the Metropolitan Water Board (Mr. A. B. Pilling) a copy of their tenth report, dealing with the work of the Board in the year to March 31 last.

The report opens, as usual, with some explanatory observations on the constitution of the Board; the particular one whose work is now dealt with being the third since their formation under the Metropolis Water Act, 1902. The members met for the first time on June 3, 1910; and they went out of office on the 1st of June last. At their first meeting, Mr. E. B. Barnard was unanimously re-appointed Chairman, and Mr. G. S. Elliott Vice-Chairman for the ensuing three years.

The actual administration of the Board is in the hands of seven Committees—viz., Appeal and Assessment, Claims, Finance, General Purposes, Law and Parliamentary, Water Examination, and Works and Stores. The number of salaried officers on April 1 was 895, whose salaries amounted to £162,320. The number of workmen and others on weekly wages at the close of the financial year was 3159; and the service staff on weekly wages was 102. The Board granted during the year, under the provisions of the Metropolis Water Act, 1902, 47 superannuation allowances to officers and servants transferred from the late Water Companies; making a total of 441 of such allowances granted since the transfer of the Companies' undertakings to the Board. A superannuation and provident fund for the benefit of the officers and servants came into operation on April 1, 1909, and the number of contributors on March 31 last was 1973—being 543 officers and 1430 servants. At the last-named date, the Board were bearing an annual charge of about £76,000 in respect of superannuations, pensions, and compensation allowances to officers and servants belonging to the Companies.

Turning to the portion of the report dealing with the financial position of the Board, we find that on the 1st of April the funded debt was as follows: "A" stock £6,060,165, interest £181,805; "B" stock £35,321,537, interest £1,059,646; redeemable debenture stocks £7,217,838, interest £216,911—total, £48,599,540; interest, £1,458,362. In addition to this, the Board are under obligation to pay certain annuities and rent charges (including the Crown "clog" of £400), which amount to £7900; making an annual interest charge of £1,466,262, which is equivalent to 4·1d. per 1000 gallons of water supplied. The net water-rental for the past year is put approximately at £2,843,630, or £18,459 more than in 1911-12; being at the rate of £2 10s. 7·94d. per service, as compared with £2 10s. 8·39d. in the preceding year.

From the section of the report furnishing particulars of the sources of supply, we find they continue to be four—viz., the Thames and the Lea; gravel beds adjoining the main stream of the Thames, and other gravel beds at Hanworth; the Chadwell spring; and wells sunk in the chalk or other strata in the Lea Valley, on the north of the Thames, in Kent, and at certain other points south of the Thames. In the twelve months to March 31 last, the Thames furnished 59·1 per cent. of the Board's total supply, compared with 59·8 per cent. during the previous year. The daily average quantity gauged at Teddington was 1820·4 million gallons—an increase of 301 million gallons compared with 1911-12. The daily average total abstraction from the river was 144·5 million gallons. The daily average natural flow at Teddington was, therefore, 1964·9 million gallons in the year, compared with 1673 million gallons in 1911-12. The total volume abstracted from the river was 52,726·7 million gallons, or 3488·9 millions less than the preceding year. Compared with that year, there was a decreased average daily abstraction from the river of 9·1 million gallons last year. Of the 144·5 million gallons daily average quantity abstracted by the Board and the Suburban Companies, the Board drew 142·1 million gallons and the Companies 2·4 millions. The percentage of the river's natural flow abstracted by the Board was 7·23, and by the two Suburban Companies 0·12, or 7·35 per cent., compared with the total abstraction of 9·18 per cent. in the year 1911-12. There was an increase of 3,115,860,000 gallons, or 16·68 per cent., in the total quantity of water abstracted by the Board from the River Lea.

The total volume of water supplied during 1912-13 was 86,889·4 million gallons, compared with 89,437·1 million gallons in 1911-12—a decrease of 2547·7 million gallons. It should be borne in mind, however, that the latter year contained 366 days. The average daily supply was 238·1 million gallons; the figure for 1911-12 being 244·1 million gallons. The southern district took the largest proportion of the total supply—viz., 25·45 per cent.; and the Kent district the smallest—8·74 per cent. The eastern district consumed 21·11 per cent. of the total direct area supply; the New River district, 19·26 per cent.; and the western district, 25·44 per cent. The month of maximum average daily supply was July. The month of minimum average daily supply was March in four districts and February in one. The difference in the total average daily quantity of water supplied between the maximum and minimum months throughout the area of direct supply was 50·83 million gallons.

The total estimated population supplied by the Board at the close of the year 1912-13 was 6,688,555; this figure being based upon the results of the census taken on April 3, 1911. For the whole area of the Board, the average daily supply per head was 35·39 gallons; while in 1911-12 it was 36·49 gallons. Approximately, 56·2 per cent. of the total population was supplied from the Thames, 25·5 per cent. from the Lea, and 18·3 per cent. from wells and springs. The total number of services supplied at the end of the year was 1,114,528—an increase of 7532 over the preceding year. The average daily supply per service was 212·65 gallons, compared with 219·92 gallons. The whole of the Board's area is now completely on constant supply, except in the southern district, where the percentage of constant supply is 96·85. The percentage of supplies on the constant system throughout the Board's area of direct supply is 99·19.

The total quantity of water supplied in bulk by the Board last year was 640,525,000 gallons, compared with 645,068,000 gallons in 1911-12—a decrease of 4,543,000 gallons. The bodies supplied and the sources of the water were: Croydon Corporation (from Thames and wells), 426,159,000 gallons; Richmond Corporation (from Thames), 187,954,000 gallons; Cheshunt Urban District Council (from wells), 26,347,000 gallons; and Herts and Essex Water Company (from wells), 65,000 gallons.

In the section of the report dealing with storage, the opening of the large reservoir at Chingford by the King and Queen on the 15th of March is first noticed. This reservoir will impound 3073 million gallons of water to be taken from the Lea. The fine installation of Humphrey pumps is a noteworthy feature of this addition to the water-works of the Metropolis. Mention has been made in previous reports of the value of storage in improving the quality of water. Dr. A. C. Houston, the Boards Director of Water Examination, has substantiated this important fact, both by the routine work of his department and by his special research work. The average capacity of water-surface area for the whole of the Board's reservoirs is 6·51 million gallons per acre. The number of days' storage is 54·22 for the total supply, inclusive of the bulk supplies. The effective amount of storage and subsidence reservoir capacity for unfiltered water possessed and in use by the Board at the end of the year was as follows:—

	No.	Area in Acres.	Total Capacity in Million Gallons.
Thames Valley	31	1026 50	7,267·5
Lea Valley	18	955·75	5,640·2
	49	1982 25	12,907·7

The total storage in existence, and authorized but not commenced, is as follows:—

Storage.	Thames. Million Gallons.	Lea. Million Gallons.	Total. Million Gallons.
Existing	7,267·5	5640·2	12,907 7
Authorized, but not commenced	10,300·0	2000·0	12,300·0
Total.	17,567·5	7640·2	25,207·7

The figure of 12,907·7 million gallons is exclusive of the Hampstead and Highgate ponds, the Camden Park Road reservoir for pond water, and the Cheshunt disused reservoirs—in all, fifteen reservoirs with a total area of 48·25 acres, and a capacity of 68·9 million gallons. Adding these brings up the total number of reservoirs to 64, the area to 2030·5 acres, and the total capacity to 12,976·6 million gallons. The number of filter-beds is 172, of 170·69 total acreage, or 0·809 acre per million gallons average daily supply of filtered water. The average monthly rate of filtration per square foot per hour last year varied from 0·86 gallon to 1·97 gallons.

The total length of mains *in situ* at the end of March last was upwards of 6364 miles. The diameters range from 2 to 54 inches; 4-inch pipes being mostly in use. During the year nearly 39·5 miles of new mains were laid. The largest extensions were in the Eastern and New River districts; being respectively 24·9 and 21·3 per cent. of the total. The length of new mains laid per additional service varied from 14·9 yards in the Kent district to 6·1 yards in the southern district; the figure for the whole area being 9·2 yards.

The following figures show the increases which have taken place under the Board in the active equipment of water-works since the transfer of the undertakings:

	Before June, 1904.	At March 31, 1913.
Storage reservoirs for unfiltered water	57	64*
Acreage of ditto	873	2030·5*
Capacity of ditto in million gallons	4077·6	12,976·6*
Service reservoirs for filtered water	75	85
Capacity of ditto in million gallons	244·5	314·0
Filter-beds	137	172
Acreage of ditto	139	170·7
Engines	235	273
Horse power of ditto	32,177	42,058
Miles of water-pipes	5,759	6,364

* Inclusive of the ponds, &c., previously referred to.

In the section of the report which treats of the miscellaneous work of the Board, the proceedings in Parliament are first dealt with; and next come references to legal matters. The important work of the Director of Water Examination (Dr. Houston) is then briefly reviewed; and the rainfall records furnished to the Board by Dr. H. R. Mill are mentioned. The total rateable value of the Board's properties is £1,212,179. It is said that the assessment of the Board's works in certain parishes represents as much as 77·7, 71, and 67·1 per cent. of the total rateable value.

Accompanying the report are appendices containing a collection of tabulated statistics, Dr. Mill's report on the rainfall in the Thames and Lea Valleys, and a list of the works authorized by the Board and the progress made with them during the year.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas-Fire Testing.

SIR,—I have read with interest the lectures by Mr. Hartley and Mr. Yates, and notice the discrepancy in time for a complete test of gas-fires. Mr. Hartley says one test per day with ease; Mr. Yates says four tests per day (eight-hour day I presume).

If a complete test can be carried out in 70 minutes, as Mr. Yates states, it would then bring the testing of gas-fires within the scope of managers of small works, who could not afford a whole day for the purpose. Perhaps Mr. Yates will say what time is allowed for the room to become steady, and also the time for each operation.

Nov. 25, 1913. INTERESTED.

The Tests of the "Sola" Gas-Fire.

SIR,—I have read the reply of Messrs. Wilsons and Mathiesons to my letter regarding the tests of their "Sola" gas-fire. I should have been glad of a first-hand reply rather than a mere quotation from a previous letter replying to Professor Bone. However, I am grateful for the answer refuting any claim to the figure of 73·1 being the percentage radiation.

In the "JOURNAL" for Sept. 30 your leading article stated, in the most explicit terms, your own belief that it was a percentage radiation. You there said that the modern gas-fire had previously reached a radiant efficiency of "rather over 50 per cent.;" and then, later, that "Mr. Bond's test ascribes to the fire [the "Sola"] a radiant efficiency of 73·1 per cent.

Percentage, in the matter of gas-fire testing, was then "in the air," thanks to the recent controversy in your columns; and your assumption was surely quite natural

It was endorsed by Professor Lewes, who, in his address on the "Evolution of Gas Lighting and Heating [see "JOURNAL" for Oct 14, p. 126], said:

> "There was one stove in the exhibition which claimed to convert (and he believed the claim was perfectly well founded) no less than 72 per cent. of the heat in the gas into radiant heat."

Further, the firm's advertisemet giving Mr. Bond's certificate had, in bold type, "Progress in Percentages."

It seems rather hard lines on other makers of similar appliances that this erroneous idea should have been given such wide publicity to on the eve of the opening day of the National Gas Exhibition, and not contradicted in your columns till now. However, it is useful to know that the figures simply mean that the new fire is so much better than last year's pattern—which latter, of course, may have been of a very low efficiency.

With regard to the last sentence of Messrs. Wilsons and Mathieson's letter to Professor Bone – which I have the honour to share—it should be a pretty easy matter to make comparative tests on the lines of the "Leeds," "Yates," "Butterfield," or "Hartley" tests between the "Sola" and other fires of this type; but I leave that to the makers of such fires.

Stirling, Nov. 27, 1913. HENRY S. VALENTINE.

Shareholding and Open Trading.

SIR,—The reference made to this subject in the paper read before the Society of British Gas Industries appears to represent a very one-sided view of the matter, and strives to see evil where none exists.

It is always advisable to examine carefully the pros and cons of any subject before bringing one's thoughts into the "limelight" of public discussion. This is especially true in the present instance, as I am quite sure there are a great number of individual members of the S.B.G.I. and the gas profession who resent the censure contained in Mr. Helps's paper.

In passing, one may point out, if any evidence is needed of the one-sided view that Mr. Helps takes of the various points treated by him, it is afforded by the fact that he considers that gas undertakings achieve their profits "without anxiety." Such a statement suggests that Mr. Helps has a very crude idea of gas manufacture, management of a gas-works, and the duties of a manager of a gas undertaking. But to return to the subject, Mr. Helps considers that "contra accounts" are wicked, and likely to create food for scandal. Many of us occasionally hear that shareholding and patronage go together; but I firmly believe there is very little, if any, truth in this assertion. I know that the wandering commercial traveller, who has failed to secure a particular order, will often explain his unsuccessful effort to his principals as being entirely due to the fact that the successful competitor is a shareholder in the firm by whom the order has been given, or that the buyer is a shareholder in the firm represented by the successful competitor. The tale is a lame one, and is generally put forward to cover up the shortcomings either of the disappointed representative, whose ability to explain the article he wishes to sell may be miserably weak, or of the article itself, which may have defects to which both the traveller and the firm he represents are totally blind. In such a case, both master and man very readily console themselves with the slanderous statement.

There certainly is no reason whatsoever why every individual in the gas industry should not be perfectly free to take up whatever investment he may consider will be the most secure and lucrative.

I would point out that if any executive official of a gas undertaking was desirous of placing his surplus capital with any firm with whom he was anxious to do business, and, for his own personal gain, prevented orders going where on merit they should go, he could if he had the smallest possible modicum of business ability achieve his object safely and easily without laying himself open to slander, by having the shares or scrip made out in the name of a friend or near relative, without sacrificing either his security of investment or illicit gain. I should certainly think that quite as much reliance for honesty and integrity can be, and is, placed in the official who openly has a contra account in his own name as one who has not.

Black sheep dwell in every fold; but I have no hesitation in affirming that the majority of men engaged in the gas industry have a keen sense of personal honour, and that it does not require or need the services of the Society to improve the conduct of the parties on either side of the fence. It is presumption on the part of Mr. Helps to make the statement that "the Society was formed by us as manufacturers to improve our conduct, in order that we might be the better able to improve the conduct of others."

I understand that the Council of the Society do not have their Chairman's annual paper printed and circulated among the members prior to the date of meeting. I venture to think that if this course had been adopted in the present instance, the treatment and feelings which the Chairman in his brief reply said he had expected to receive from the members present, would have been completely and fully realized.

In conclusion, let me commend to Mr. Helps the quotation "*Honi soit qui mal y pense.*"

Stafford, Nov. 29, 1913. W. M. VALON.

Street Lamp Tests in Windsor.

SIR,—The publication in the "JOURNAL" for Nov. 18 (p. 603) of Mr. Buckley's communication to you, relative to the street lighting here, partially gives effect to my suggestion; but you still do not state why these miraculous results were not submitted to the Windsor Corporation.

To return to Mr. Buckley. His figures appear to be a bit mixed. He mentions 600-candle power lamps, yet his expert tests give 1300; and the lamp which his friends found to give this was the one offered by my Company for £10 per annum—the one we were offering for £14 per annum he omitted to measure.

Referring to the tenders, we offered 31 three-light, each lamp 200 watts, at £14, or 31 three-light, each lamp 100 watts, for £10. The latter lamp was that which Messrs. Alex. Wright and Co. tested. The tenders, therefore, were as below:

GAS.

31 gas "arcs," 1300 c.p. (as measured by Messrs. A. Wright and Co.), 40,300 c.p. at £12 . . . . . £372

ELECTRIC.

31 metallic groups, 1300 c.p. (as measured by Messrs. A. Wright and Co.), 40,300 c.p. at £10 . . . . . £310

We must assume that the town would have saved 2s. 6d. per lamp on each of the 300 side-street lamps, amounting to £37 10s., had the gas tender for the whole town been accepted. This, however, would still have been more costly than electricity to the amount of £24 10s.; and, as to the candle power, this is based on Mr. Buckley's own expert's figures. But why he should subtract the figures of the new gas tender from those of the old gas and electric tenders, to show what might have been saved, is incomprehensible to me; and I am at a loss to understand how he could read 300 single 70-candle power lamps into our tender, as we did not tender for the side-street lighting!

It ought to interest your readers to know that the three-burner lamp offered by the Windsor Gas Company in their tender for £12 per annum, erected in Park Street, when tested by Mr. Haydn Harrison on Sept. 8, gave only 380-candle power at 8° from the horizontal. Perhaps this is why the Gas Company ultimately substituted a four-burner lamp at the same figure. Why did Messrs. Wright and Co. not publish the results obtained at this most important angle? Mr. Buckley hopes for better luck next time. It is only with luck that he will get what he wants.

I am quite well aware of the circumstances attending the settlement of the Holborn contract. Yet, after all, what was the result? The Gas Company gave up half the contract. Why did they take this settlement lying down?

I consider the publication of the figures which Messrs. Wright and Co. have given a splendid advertisement for the Osram lamp; and the Union Electric Company must feel very gratified at the results obtained from this lamp.

Among the loving epithets which you so kindly shower upon me, I observe our old friends "stupid" and "egregious," adjectives which appear to be retained in the vocabulary of the "JOURNAL" specially for electricians. In addition to these, I note that I am favoured with a new one—*i.e.*, "sapless." I feel ex—I mean dis—tinguished; and grateful I really am when I reflect that I must be among the first to reap the result of your long and weary hours spent in the dull depths of the dictionary.

Windsor Electrical Installation Company, Nov. 25, 1913. A. E. FARROW.

[Our correspondent's letter is a remarkable one, and does not bear a great deal of examination. There are parts of it that can only be answered by those who are more cognizant of what has transpired at Windsor than we can possibly be. We are not aware why the tests made for the Gas Company were not submitted to the Windsor Corporation. But we have those tests now; and Messrs. Alexander Wright and Co. have a reputation for scientific photometry and honesty to protect them against any damage from the contemptuous sneer (as contained in the use of the words "miraculous results") of anyone in the position of Mr. Farrow, whose photometrical experience has been child's play compared with that of the firm in question. The second paragraph of the letter can only be replied to by Mr. Buckley. In the third one, we obtain interest. Mr. Farrow says his Company offered to supply "31 three-light, each lamp 100 watts, for £10;" and he says this was the lamp tested by Messrs. Alexander Wright and Co. A little lower down Mr. Farrow, with doubtless his

tongue in his cheek, calls these lamps 1300-candle power ones. The consumption of the cluster of three lights he places at 300 watt-hours (100 each); and therefore he claims an efficiency, on the figures he presents, of about 4·3 candles per watt. This is really interesting. It is more; it is "miraculous." The 0 5 watt lamp is not in it. But let us go on to his little comparison. The mean of the Graetzin lamp tested was 1320·9 candles × 31 = 40,947; whereas the mean of the cluster of metallic filaments was only 944·44 × 31 = 29,277 candles. Mr. Farrow, in his calculation, ingeniously takes the result at the 20° angle, and not the mean. Now, on these figures, the gas-lamps are worth a good £100 more than the electric lamps; and still more if quality of light, distribution, and reliability are taken into account. The gas-lamp showed a fairly uniform test at both the 20° and 50° angle (1301 and 1340 candle-power); but the figures for the metallic filament three-light lamp are 1300·14 and 588·74 respectively (*ante* p. 603)—the mean being 376·46 candle-power higher in the case of the gas-lamp, which is well worth more than the extra £2 per annum asked for lamps of this type. The angles of 20° and 50° are the ones that have been adopted for testing in the London street-lighting contracts that are based on illumination. Regarding the question of "luck," we have had the curiosity to refer to the "Manual of Electrical Undertakings," and to the "Municipal Year Book;" and unless there are duplicates of these gentlemen in Windsor, it seems that Sir William Shipley, the Chairman of the Windsor Electrical Installation Company, is a member of the Corporation or has been (one of our books is not quite up to date), and the Solicitor to the Company appears to be the Town Clerk of Windsor. Far be it from us to suggest that these gentlemen exercised an iota of influence in this street-lighting business; but what we do suggest is that it is very useful (gas undertakings have found it to be so in other towns) to have men in local councils who can present one's case. Whether this was done in the present instance, we have not the slightest knowledge. The Gaslight and Coke Company did not take the Holborn settlement lying down. Supposing we reverse Mr. Farrow's question, and ask him why the Electric Supply Company took the settlement lying down, and were thankful enough to enter into it? Can he reply? These are the simple facts: The Gas Company had tendered; and their figures had been published. The Electric Supply Company tendered with these figures before them. The Gas Company protested against this unfairness. New tenders were invited; and then competition meant prices still lower than the Electric Supply Company had tendered at already in order to get a partial innings. The Companies were wise under the circumstances in the course they took. Perhaps Mr. Farrow does not think so. We notice that our correspondent does not tell us why it was that in the Manchester and Holborn tests gas-lamps of lower initial candle power than the electric lamps gave an equal or a higher illumination midway between the lamps. Apparently Mr. Farrow spends time in penetrating the "depths of the dictionary," as he assumes other people do the same. But let us assure him that the word "sapless" came to mind unaided by anything but his own former letter, and more a apt description of that letter there could not have been.—Ed. J.G.L.]

In order not to prolong the correspondence to too great length, we forwarded a copy of Mr. Farrow's letter to Mr. Buckley; and, after the above was written, the following comment was received from him:

Sir,—The Chairman of the Lighting Committee saw the results of the tests we made. As our tender was to specimen lamps and not candle power, there was no object to be gained in publishing the figures. When the tests referred to were made, the only metallic filament lamps were three-light ones (whether 100 or 200 watts I do not know).

I took the lower tests of the two types, hence the 600-candle power, which was quite in order. The 100-watt lamp would not have been adopted for the main street lighting. In addition to the saving I mentioned before, the Gas Company offered to hand over the columns to the Corporation at the expiration of the contract.

The reason the lamp was not tested at 8° from the horizontal was that Messrs. Alexander Wright and Co. were instructed to test at the same degrees as in Westminster. The Gas and Electric Companies who supply light to that Council are subject to a penalty if the lamps are below the candle power tendered for; and Mr. Bradley, the City Engineer, after consulting with the Companies, agreed to the angles of 20° and 50° as being the most suitable.

The four-burner lamp was not on the market when the tender was sent in; and it was not substituted for the three-light one on account of Mr. Harrison's tests. I was not aware any tests had been made until after the lamp was ordered.

H. Buckley, Engineer.

Windsor Royal Gaslight Company,
Nov. 29, 1913.

Water Supply for Blackrock (Co. Louth).—The Dundalk Urban District Council have approved of a scheme to provide a water supply at Blackrock, a favourite seaside resort, the summer population of which is about 6000. The cost is estimated at £5000. The water will be supplied from Dundalk at a cost of £2320.

REGISTER OF PATENTS.

Production of Ferrocyanides.

Coleman, W. H., of Withington, Manchester.

No. 27,908; Dec. 4, 1912.

This invention relates to a process for recovering hydrocyanic acid and producing from it certain ferrocyanides by bringing gases containing the hydrocyanic gas into contact with ferrous compounds and with solutions of suitable alkalies. Its main objects are "to enable such recovery and production to be carried out at less working cost and with less expenditure on plant than is at present possible."

The patentee remarks that, as has before been known, gas-retort, coke-oven, or other light gases containing hydrocyanic acid (freed or not from any ammonia or benzol) are passed over or through a mass of solid ferrous compound in the presence of a solution or suspension in water of a hydrate or hydroxide or carbonate or sulphide of an alkaline metal or of an alkaline earth metal or of magnesium or of ammonium or of other suitable base capable of forming a soluble ferrocyanide. The mass of solid ferrous compound is preferably in the form or physical condition which readily permits the flow through it of the gases and the alkaline solution or suspension. In its passage the hydrocyanic acid combines with the iron and the alkaline metal or alkaline earth metal in the alkaline solution to form a ferrocyanide solution of the metal, which can then be purified and "alkaline ferrocyanides in a marketable form be crystallized out or otherwise recovered in the known manner."

The present invention consists in using Cleveland iron ore or other suitable native ore as the ferrous compound, and carrying out the treatment in a tower packed with roughly-shaped pieces of the ore—sufficient spaces being left between the pieces to permit the free passage of the gases zig-zag up the tower through the spaces, and the downward passage through the spaces of the alkaline solution or suspension. Gas containing hydrocyanic acid is led into the bottom of the tower and passes upwards through the mass of iron ore; and at the same time the required alkaline solution flows downwards in the tower through the ferrous mass and through the ascending stream of gas. The gas is led away at the top of the tower, and the ferrocyanide solution of the alkaline or alkaline earth metal is led away at the bottom, when sufficiently strong in ferrocyanides.

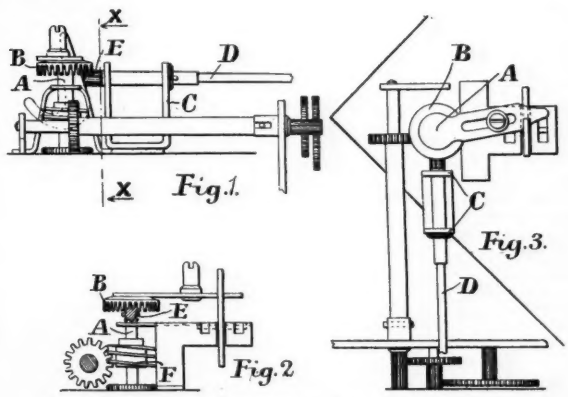
Preferably two similar towers, containing masses of iron ore, are employed. The tower in which the gas is first treated is supplied with liquid which has already been used in the other tower; and this liquid is withdrawn from the first tower when strong in ferrocyanides. Gas after treatment in the first tower passes to the second tower, where its treatment is continued and concluded in the presence of liquid weak in ferrocyanides. The required alkaline solution or suspension is supplied to the second tower. There is a constant circulation of liquid through each tower, as well as the flow from the second tower to the first. Water or fresh solution or suspension is added to the second tower (as required) to make up for the strong solution drawn off from the first tower.

Leakage Detectors for Gas-Meters.

Marsh, H., and Parkinson and W. & B. Cowan, Limited, of Kennington Road, S.E.

No. 29,343; Dec. 20, 1912.

This indicating mechanism—more specifically for detecting leakage in gas-meters—is independent of the ordinary recording mechanism, yet enables "indication to be made on the ordinary dial by means of a rotating pointer."



Marsh's (W. & B. Cowan) Leakage Detector for Gas-Meters.

Fig. 1 is a side elevation; fig. 2, a section on the line of fig. 1; and fig. 3, a plan of a construction according to the present invention.

The dry gas-meter shown is constructed with the usual parts, and on the crank shaft A is mounted an inverted crown wheel B. A U-shaped piece of metal C forms two bearings for a shaft D, which at one end carries a pinion adapted to gear with the crown wheel, and at the other end carries a pointer (not shown) in front of the usual dial plate. This pointer—preferably provided with two opposite fingers—rotates over a circular scale, "or there need be no scale, for (because of the gearing) leakage of the gas can easily be detected by observing the pointer."

When applied to existing meters, it enables an ordinary pointer to be inspected at the usual meter dial plate, and is independent of the

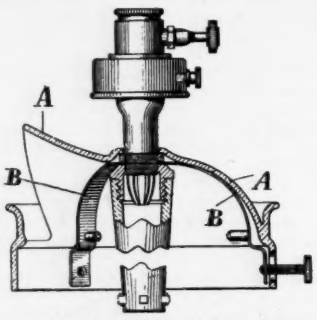
indicating mechanism, in that it is driven from the same means—viz., from the crank shaft A, which drives the indicating mechanism, but not from the mechanism itself.

Inverted Incandescent Gas-Burners.

BLAND, C. W., of Little Trinity Lane, E.C.

No. 153; Jan. 2, 1913.

This invention relates to the diverter for conveying the products of combustion away from the mixing tube and the globe gallery of an inverted gas-burner.



Bland's Diverter for Inverted Gas-Burners.

The diverter A is made of porcelain, china, or other refractory material, and for the purpose of strengthening it against liability to fracture, a metallic support or spider B, fitting loosely on to the threaded nozzle of the burner, is used. The arms of the spider are shaped somewhat to the contour of the diverter, so that the latter is further supported by the arms; and at the lower ends are holes to receive screw stems turned by the mill heads to carry the flange of a globe or shade.

Transmitting Fluctuations of a Liquid Level to Measuring Apparatus

GAGG, A., of Zurich, Switzerland.

No. 8798; April 14, 1913. Convention date, April 27, 1912.

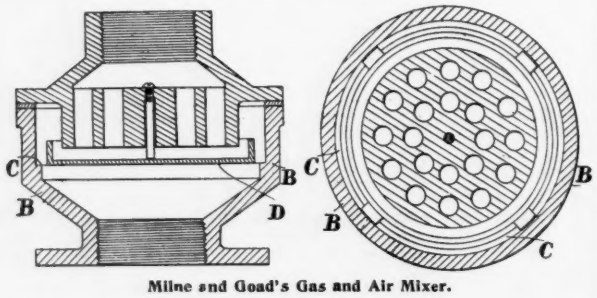
This method for transmitting the fluctuations of the level of a liquid in (say) a reservoir to measuring or regulating apparatus consists in causing the liquid to flow from the reservoir into and out of an auxiliary reservoir so that in the auxiliary reservoir the liquid is caused to rise in a manner dependent on the liquid level in the principal reservoir. The head is dependent on the size of the discharge opening in the auxiliary reservoir; and if the discharge opening is maintained constant, the head is merely dependent upon the quantity entering the auxiliary reservoir in a unit of time. If the quantity is made dependent on the level of the liquid, the head in the auxiliary reservoir constitutes a measure for the level of the liquid in the main reservoir. By rendering this head visible from the exterior—for example, by the provision of glass walls, or by transmitting it to special measuring devices—then, with the aid of a scale, the height of the water level in the principal reservoir can be read at any moment from the head in the auxiliary reservoir; and it is possible, by the interposition of transmission means, to obtain diagrams of the fluctuations of the level of the liquid in the main reservoir. The static pressure of the head in the auxiliary reservoir can also be transmitted to auxiliary motors operating regulating devices so as to maintain as constant as possible the liquid level in the main reservoir, or which actuate devices for starting or stopping engines, pumps, and the like.

Mixing Gas and Air for Gas-Burners.

MILNE, J R., and GOAD, F. L., of Edinburgh.

No. 9911; March 10, 1913.

This invention relates more particularly to the type of mixing device wherein the gas and air are caused to pass through holes (and are afterwards directed backwards over the edge of a projecting rim) instead of, as heretofore, being passed through gauze or through comparatively fine perforations in diaphragms or thin plates.



Milne and Goad's Gas and Air Mixer.

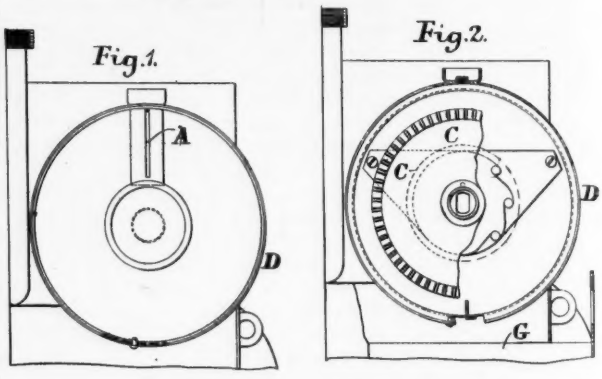
The device shown is adapted to be screwed on to the supply pipe or tube; being formed with a central body part having a series of apertures or holes in it. Connected with the casting by screws or their equivalent is a hollow piece B adapted to communicate with the nozzle or burner. It is formed on the interior thereof with an annular ledge C, upon which rest a series of snugs or projections formed on a plate or disc D, which latter is retained in position by a screw in the body part. Formed on the disc is an upturned rim or edge over or around which "the mixture of gas and air is caused to flow in such manner that the mixture, in its passage through the device, is intimately mixed and broken up."

Prepayment Gas-Meters.

SUTHERLAND, A. G. & J. C., and A. G. SUTHERLAND, LIMITED, of Birmingham.

No. 12,046; May 23, 1913.

This invention is directed to the coin-freed mechanism of prepayment gas-meters, so as to render the mechanism noiseless while in operation, at the same time preventing "pumping." It also provides an improved prepayment stop-device adapted to be automatically brought into action by the forward or rearward movement of the usual valve-operating screw, so as to prevent the insertion of other coins after the full prepayment capacity of the meter has been reached, and which device is automatically rendered inoperative after the part value of one coin has been consumed.



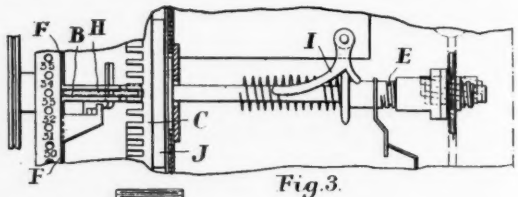


Fig.3.

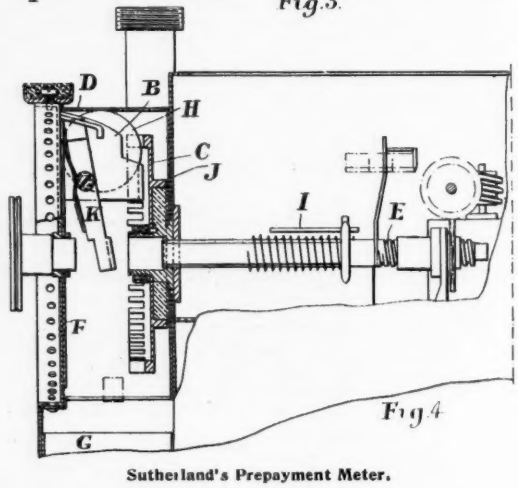


Fig.4

Sutherland's Prepayment Meter.

Fig. 1 is a front elevation. Fig. 2 shows the price-changing disc removed and certain parts broken away. Fig 3 is a plan. Fig. 4 is a longitudinal sectional view, with the mechanism ready for the insertion of a coin.

The operation of the meter mechanism is as follows: On a coin H being inserted through the slot A, it passes into the carriage B, and is retained therein while at the same time taking between two of the teeth of the crown wheel C—thus forming a connection between the disc F and the crown wheel. The handle is now turned anti-clockwise, and with it the disc, coin, and crown wheel—the latter freely turning on the fixed member of the free-wheel device in the known manner, till such time as the carriage B engages the stop in the casing D, whereupon the coin falls from the carriage into the money box G, thus breaking connection between the disc and crown wheel, leaving the disc free to be brought back to its original position—*i.e.*, opposite the slot A. While this has taken place, the compound screw E, by the engagement of its plain portion with the sleeve of the crown wheel C, will have been screwed outwards a distance sufficient to operate the fork I to admit the values-worth of one coin; and, by reason of the interposition of the free-wheel device while the coin is in action, pumping of the screw E is prevented by the jamming of the rollers between the faces of the fixed member of the free-wheel device and the wall of the

recessed portion J of the free wheel—that is to say, any backward movement of the crown wheel, and consequently the screw E, is at once prevented; the pockets and faces being arranged in the position (as shown) where they, through the balls or rollers, obtain the maximum amount of resistance or efficiency. By reason of such positioning, only three rollers or balls need be employed—"a saving in cost of manufacture also."

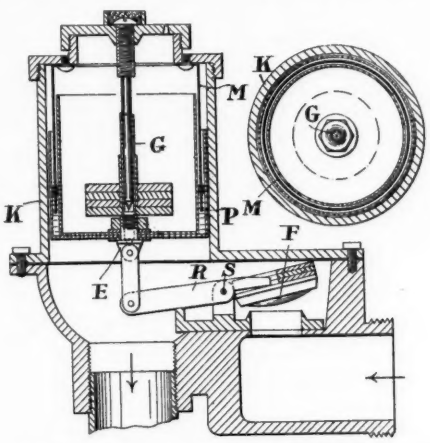
At the same time as the last coin will have been passed to the money-box, the end of the plain portion of the screw E will have engaged with the end of the prepayment stop, bringing the end or projection of the lever K away from the position shown in figs. 3 and 4—*i.e.*, moved inwards so that, when the disc F is brought back, the stop will then take between the carriage and a projection on the stop—blocking the slot A against the insertion of any extra coin, and keeping it blocked till such time as the end of the plain portion of the screw E leaves the end of the lever owing to the backward travel of the screw due to the consumption of gas, whereupon the coin carriage is again brought into alignment with the slot.

Mercurial Gas-Governor.

PARKER, J., and A. G. SUTHERLAND, LIMITED, of Birmingham.

No. 13,557; June 11, 1913.

This fluid-seal governor is of the type in which the seal increases as the inlet valve closes; and the invention is characterized by a movable well or fluid container and a fixed depending shell or bell dipping in the fluid—the movable member having a rise or fall according to, and operated by, the pressure in the reduced pressure chamber.



Parker and Sutherland's Mercurial Gas-Governor.

The well is formed of two material stampings, one within the other, and secured rigidly together by a bolt and nut. The bolt has at one end an eye E, to make connection with the valve F, and, at the other end is provided with a guide-tube G to take a guide pin screwed through the cap of the top cover of the body of the casing K. On the underside of the top cover, and fixedly secured to it, is a bell M, open at the top, and which takes loosely into the annular space between the stampings (forming the double walls of the well), into which mercury is poured in quantity sufficient to immerse, when the valve is fully open, the end P of the bell depending from the cover. The weight of the well and contained fluid is counterbalanced by the addition of weights secured to the inlet valve F or to the valve lever R on the same side of the fulcrum S as that upon which the valve is situated.

To change the outlet pressure, weights are added to, or taken from, the well; access through the shell being had by removing the cap of the cover, and without either shutting off the gas or, by breaking the mercury seal, placing the inlet pressure gas in communication with the atmosphere. The manner in which the well and the depending shell are formed renders it possible, it is said, to obtain an effective seal by the use of an extremely small quantity of mercury; "this being a point of high importance in the cost of manufacture."

Retort-Furnaces.

GOHMANN, A., of Stettin, Germany.

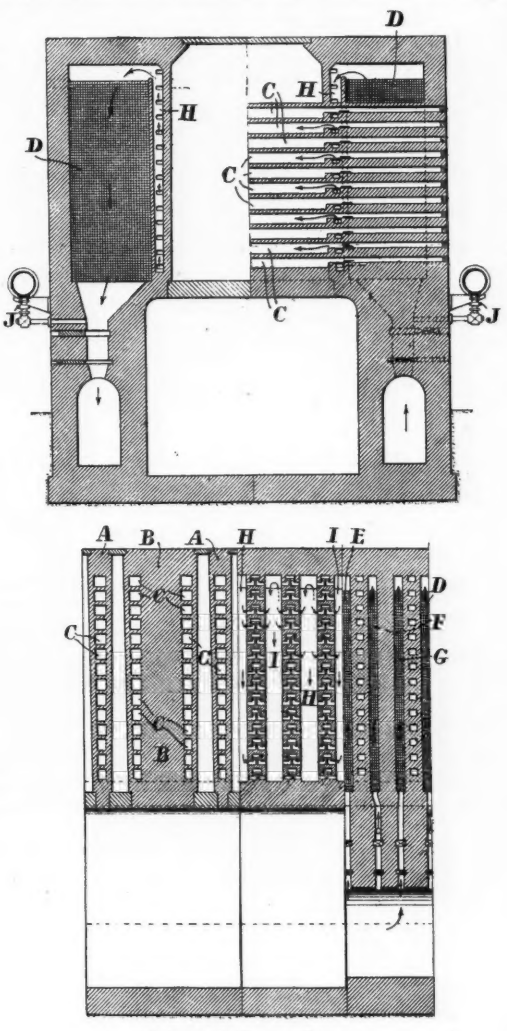
No. 13,518; June 11, 1913. Convention date, Nov. 18, 1912.

According to this invention, the retorts are divided by wide heating walls into several groups; and each of the heating flues in the narrow heating walls between the individual retort-chambers of each group is connected at both ends to two of a series of regenerators between the end regenerators of the group. Further, the walls between the groups of retort-chambers are provided with separate heating flues for the end chambers of each group, each of which is connected at both ends to only one end regenerator and to the adjoining intermediate regenerator of the corresponding group. With this arrangement the patentee claims that it is possible, while keeping the construction of the regenerators as simple and as compact as possible, to cut out single groups of retort chambers, without having to stop the heating of the other groups of retorts. If a group of retorts is to be stopped, it is merely necessary to cut out the corresponding regenerators and shut off the corresponding gas-pipes.

The retort-furnace illustrated in cross and longitudinal section is provided with vertical retorts arranged next to each other in groups of five. Between the individual chambers of each group are comparatively narrow heating walls A, while between the various groups of retorts are comparatively wide heating walls B. Each narrow heating wall is provided with a series of superimposed horizontal heating flues C; and in the wide heating walls two series of flues are provided, each near one of the two adjoining retorts. In both lateral walls of the furnace, adjacent to each retort, is arranged vertically a comparatively wide regenerator D or E. In line with each heating wall in each of the two lateral walls are vertically arranged two regenerators F or G which are half as wide as the other regenerators. Alternate regenerators are used for the preliminary heating of the heating gas and of the combustion air—that is to say, the regenerators D and F effect the heating of the heating gas, and the regenerators E and G the heating of the combustion air.

The wide gas regenerators and air regenerators are connected to vertical gas-distributing conduits H or air-distributing conduits I, arranged at their inner sides, by means of openings provided at the upper end of the partitions shown. In a corresponding manner, the narrow gas regenerators and air regenerators are connected to gas-distributing conduits or air-distributing conduits arranged at their inner sides. From these distributing conduits branch off transversely of the retorts two series of short conduits, which communicate by slots with other conduits, which extend outwards and adjoin the upper half of the heating flues C at both ends.

Each gas regenerator D is connected by the distributing conduits H



Gohmann's Retort-Furnace.

and the branch conduits to the heating flues C next to it, while each air regenerator E is also connected to the heating flues provided at both sides of the retort arranged next to this regenerator. The gas regenerators arranged at the end of a group of chambers are, on the other hand, connected by distributing conduits and branch pipes to only the series of heating flues provided in the corresponding heating wall and belonging to that particular group of retorts, while the air regenerators G at the end of a group of retorts are connected only to the series of heating flues situated in the corresponding heating wall and belonging to that particular group of retorts.

When the retort-furnace described is used for the manufacture of lighting gas, the direction in which the heating flames flow is alternated. During one period the gas-valves J, for instance, on the right-hand side are opened, and the dampers of the conduits connected to the gas regenerators D F are closed on this side of the furnace. On the left-hand side of the furnace the gas-valves are closed, and all the slides in the conduits are opened. The heating gas, admitted through the pipes of the right-hand side of the furnace, flows through the corresponding regenerators D F, in which it is heated in a preliminary manner, and then passes through the distributing conduits, branch conduits, and slots, into the heating flues C. The combustion air, admitted through the flue of the right-hand side of the furnace, flows into the corresponding regenerators E G, in which it is heated in a preliminary

manner; and it passes thereupon through the distributing conduits, branch conduits, and slots, into the heating flues. On the left-hand side of the furnace, the waste gases escape from the heating flues through all the slots, in order to pass through the branch conduits into the regenerators of the left-hand side of the furnace, so that the latter are heated; and they finally escape after passing through the regenerators on the left-hand side of the furnace, through the conduits and the flue into the chimney.

At the beginning of the next period, the gas-valves on the right-hand side of the furnace are closed, and those on the left-hand side opened. In the same way the slides on the right-hand side of the furnace, belonging to the gas regenerators, are opened, and the corresponding slides on the left-hand side of the furnace are closed. Then the same process as that described takes place in the reverse sequence; so that, in the regenerators on the left-hand side of the furnace, a preliminary heating of the heating gas and of the combustion air is effected, while the regenerators on the right-hand side of the furnace are heated by the waste gases.

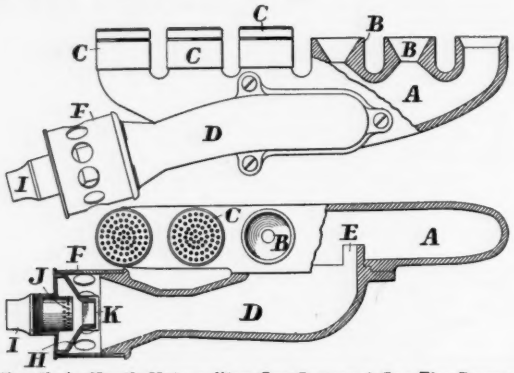
If the consumption of gas as generated by the furnace is reduced, one or more groups of retorts can be cut out without disturbing the working of the other groups of retorts, by merely closing all the corresponding gas valves and slides on both sides of the furnace. As the end regenerators of the inoperative group are not connected to the heating flues of the adjoining groups, the latter continue to work without any disturbance. In the same way, the heating of the end chambers of the groups which continue to work is not affected, as they are separated from the inoperative group by the wide heating walls, and each end chamber is heated by separate flues in the corresponding heating wall.

Gas-Fire Burners.

South Metropolitan Gas Company, and Chandler, D., of Old Kent Road, S.E.

No. 13,738; June 13, 1913.

According to this invention, the burner nozzles at their outlets are all of the same area; and the caps which cover them are all equal in size. But, although the outlets of the nozzles are equal, internally they are not so—that is, the nozzles near the mixture inlet are conical internally, and have a smaller passage area than those on either hand; so that "there is an equal height of flame from all the nozzles, which would not be the case were the nozzles all of the same internal capacity, or of unequal dimensions at the outlet, owing to the different pressures at the middle and near the ends of the chamber."



Chandler's (South Metropolitan Gas Company) Gas-Fire Burner.

The illustration is a back elevation (partly in section) of the burner and a plan (also partly in section).

The hollow chamber A has a number of upstanding nozzles B, all of which are of different passage areas in cross-section with equal outlets, and each is fitted with a detachable perforated cap C. [In the plan one of the nozzles is shown without its cap.] D is the mixing tube attached about midway of the length of the chamber A. Air and gas enter by the tube D, and the mixture "is distributed as equally as possible throughout the whole length of the chamber." E is a baffle extending partly across the chamber, to prevent any direct rush of the mixture to the end of the chamber in the direction of the current. F is a sleeve fitted on to the inlet end of the tube D and provided with air holes. H is a conical fitting inserted in the sleeve; and I is the injector inserted at its base. The only outlet for gas from the injector is by the holes J. The outlet from H is by the perforated disc K. This arrangement, it is said, provides an efficient trap for foreign matters which may be carried in by the gas, as any foreign matters are caught and retained by the trough-like interior of the fitting H, and the perforated disc K is therefore not likely to get stopped up.

Coal Trade Profit-Sharing Scheme.—At an extraordinary meeting of William Cory and Son last Thursday, Sir A. C. Cory-Wright, the Chairman, explained a scheme whereby the employees of the firm should be directly interested in its welfare, and obtain some benefit from its progress and prosperity. They proposed, he said, to create an issue of 250,000 employees' shares of £1 each, to rank *pari passu* with the existing ordinary shares, and to give the employees who are male members of the Cory Thrift Society, now numbering 1500, the right to subscribe at par for any number of these shares up to 100 each. The Directors hope that, as a result of this co-partnership interest being established, the men will in future be brought into closer touch with each other and with the management, and that it will tend to promote the still greater welfare of the Company in which they are part proprietors.

PARLIAMENTARY INTELLIGENCE.

TESTING HIGH-PRESSURE GAS-METERS IN LONDON.

Action by the London County Council.

The London County Council have given notice of their intention to apply to Parliament for authority to prescribe rules and conditions to be observed as to the form, method of construction, testing, stamping, &c., of all meters and the indices of meters used for measuring gas supplied at or above such high pressure as may be defined in the intended Act; to prescribe tests for soundness, leakage, and correctness to which such meters and indices shall be subjected; and to empower the Council to make regulations as to the verification of such meters and indices. They will also ask for power to prohibit the use in the Administrative County of London, or part thereof, of any such meters and indices as do not comply with the provisions of the intended Act; to provide that only such meters and indices as do so comply shall be stamped in the county, or any part of it, by an inspector appointed in pursuance of the Sale of Gas Act, 1859, as amended by any subsequent Act; and to require certificates to be issued by inspectors when stamping meters and indices under the provisions referred to—meters and indices so stamped and certified to be accepted throughout the United Kingdom as complying with the provisions of the Act of 1859. The Bill will or may make provision as to the examination, testing, stamping, and certification of meters and indices by inspectors appointed by authorities outside the County of London, and the acceptance of meters and indices so stamped and certified as complying with the provisions of the intended Act. Authority will be sought to prescribe the fees to be charged for the examination, testing, and stamping of such meters and indices; to provide for the variation of such fees; to substitute, to the extent specified in the intended Act, the before-mentioned provisions for those contained in the Sale of Gas Act, 1859, and other Acts amending it; and to repeal, amend, or apply those Acts or any of them.

NOTICES GIVEN FOR BILLS (SESSION 1914) RELATING TO GAS, ELECTRICITY, AND WATER SUPPLY.

[Second List.]

Ashington Urban District Council.—Power will be sought by the Ashington Urban District Council to manufacture and supply gas within their district, and in the parishes of North Seaton, Woodhorn, Cresswell, Ellington, Bothal, Demesne, Pegswood, and Sheepwash, in the rural district of Morpeth. It is proposed to acquire the gas mains, pipes, and meters of the Ashington Coal Company, Limited. The Bill to be promoted will contain provisions enabling the Council to fix and define the price of gas, charge differential rates, and prescribe the burner and instruments to be used for testing purposes. Provision will be made with reference to the supply of gas for power, and the charge to be made therefor; also for the sale of gas in bulk. Authority will be required to borrow money for the purposes of the intended Act, and for the general purposes of the gas undertaking.

Barnsley Corporation.—The Corporation of Barnsley intend to apply for authority to supply electrical fittings, lay electric lines and water-pipes in streets not dedicated to public use, and make other provisions with regard to water-pipes, electrical apparatus, and the supply of electricity. They require an extension of time for constructing the Knoll Brook Water-Works, and power to alter and increase the water-rates and test, stamp, and certify gas-meters. They also desire a revival and extension of time to adopt the Sale of Gas Act, 1859, and an extension of the period for the repayment and consolidation of their water loans. Additional borrowing powers are also required.

Bedwas and Machen Urban District Council.—Authority is required by the Bedwas and Machen Urban District Council to supply gas in the parish of Machen Upper, and in portions of the parishes of Rudry and Rhydygwern, in the rural district of Llandaff and Dinas Powis. The Council wish to purchase certain lands for gas-works purposes. The Bill will contain the general provisions applicable to the supply of gas for ordinary or power purposes, and to its sale or purchase in bulk within and beyond the gas limits. Borrowing powers will be required.

Bolton Corporation.—Additional powers are required by the Bolton Corporation in respect of their gas and water undertakings. They wish to be authorized to use certain lands already in their possession, adjoining their Gas Street station, for the erection of works and the manufacture and storage of gas and residual products; also to acquire other lands by agreement. They likewise desire power to construct and maintain a well or bore-hole in the urban district of Turton, three aqueducts, and a water-tower. The Bill will contain various general provisions in regard to the supply of both gas and water.

Bristol Water.—The Bristol Water Company will apply for authority to raise additional capital.

Deal and Walmer Gas and Electricity.—Power will be sought by the Deal and Walmer Gas Company to produce, store, and supply electricity in the boroughs of Sandwich and Deal, in the urban district of Walmer, and in the parishes of Ripple, Sholden, Great Mongeham, Ringwould, and Word (or Worth); and they will apply for the transfer to them of the undertaking authorized by the Sandwich, Deal, and Walmer Electric Lighting Order, 1911, and the powers of the undertakers under it, or the repeal of the Order and the cesser of the powers. Authority will be required for the extension of the gas limits to include the parish of Word, or some portion thereof; the construction of electricity generating stations and additional works for the manufacture and storage of gas and residual

products; the repeal of the maximum prices for gas and the adoption of the sliding-scale; the reduction of the standard of illuminating power, the formation of benefit funds, co-partnership schemes, and pensions; and the alteration of the name of the Company. More capital will be required.

Ellesmere Port and Whitby Urban District Council.—The Council intend to apply for sanction to the transfer to them of the gas mains and pipes of the Shropshire Union Railways and Canal Company, and for authority to supply gas in the urban district of Ellesmere Port and Whitby, and other places in the county of Chester, acquire lands, and manufacture and store gas and residual products. The Bill will contain general provisions in regard to the supply of gas and electricity, and also for testing the calorific value of the former illuminant.

Hightown Gas and Electricity.—Authority will be sought for the incorporation of a company for the supply of gas and electricity within the parish and urban district of Little Crosby, in the county of Lancaster, for the purchase of lands and the construction of gas-works, and for the establishment of an electricity generating station. The Bill will contain the usual provisions incidental to the supply of gas and electricity, including the purchase and sale of the former, and the sale of the latter in bulk. Separate accounts will be kept of the two undertakings. Capital and borrowing powers will be required.

Llanfaelog Water.—The Valley Rural District Council purpose applying for authority to construct water-works for supplying Llanfaelog and other places in Anglesey, for which purpose it is proposed to utilize the Bodsuran stream and other streams and springs. The works will comprise an impounding reservoir on the stream named, a service reservoir in the parish of Llanfaelog, seven aqueducts or pipe-lines, one or more filter-beds, the diversion of a footpath, and the widening of a road. The usual powers in connection with the supply of water will be applied for.

London County Council (Testing High-Pressure Gas-Meters).—The notice given by the London County Council in regard to this matter will be found on page 756.

Maidenhead Corporation.—Authority will be sought for the transfer to the Corporation, by compulsion or agreement, of the undertaking of the Maidenhead Water Company, with power to maintain and improve the works, construct subsidiary works, and supply water in the parishes of Bray, Cookham, Hurley, Hurst, Shottesbrooke, Waltham St. Lawrence, and White Waltham, and parts of the parishes of Wargrave and Ruscombe.

Market Rasen Water.—Authority to construct new works, consisting of two storage reservoirs, a service reservoir, and three aqueducts or pipe-lines, will be sought by the Market Rasen Water Company, who wish to be empowered to raise additional capital. The Bill will contain provisions in regard to the waste and fouling of water, the protection of the water and works, the supply of meters and fittings, and the sale of water in bulk.

Mexborough Water.—The Mexborough and District Water Company, Limited, desire to be dissolved and reincorporated with authority to maintain the existing works and construct new ones, consisting of a receiving tank, to be situated in the parish of Barnbrough, and a line or lines of pipes extending from it to the existing pumping-station at Mexborough. The limits of supply are the parish and urban district of Mexborough. The usual powers are required, as well as authority to raise additional capital.

Middlesbrough Corporation.—The Corporation of Middlesbrough will apply for authority to purchase the undertaking of the North Ormesby Gas Company, Limited, and to exercise the powers of gas supply in the Company's area. The Bill will define the extended limits, and contain provisions with respect to the illuminating power, purity, and pressure of the gas to be supplied within them, and to the testing of the gas. Authority will be sought to reduce the illuminating power, or, if thought fit, to "repeal the statutory provisions affecting the Corporation and the Company whereby a test of the illuminating power of the gas supplied by them or either of them is imposed, and to substitute therefor a test of the calorific value of the gas," with such penalties and conditions as may be defined by the Bill or prescribed by Parliament. The price of gas is to be fixed and defined; and power will be sought to charge differential rates. Provision will be made for the transfer to the Corporation of all or any of the officers and servants of the Company, and also for the payment of compensation to the Secretary and Manager and such other officers as may lose their position or employment by reason of the transfer. Further powers will be required with respect to the existing and the enlarged gas undertaking, as well as to the electricity undertaking of the Corporation; and more money will be needed.

Newport (Mon.) Corporation.—In a General Powers Bill of which notice has been given by the Newport (Mon.) Corporation, they will make further provisions in regard to their water undertaking, more especially, but not exclusively, with reference to altering the dates of payment of any rates, rents, and charges in respect of the supply of water, meters, or fittings, and providing that these shall be payable on such dates (whether in advance or otherwise) as may be appointed by the Corporation or prescribed by the intended Act. The Corporation wish to be relieved from any obligation to supply water (except by measure) to premises used for trade, business, or other purposes. The Bill will make further provision with reference to preventing the pollution and preserving the purity of the sources of supply, and protecting the water-works.

Northwich Urban District Council.—The Council intend to apply for an extension of their water limits so as to include the parishes of Rudheath and Winnington, in the rural district of Northwich, in the county of Chester. They desire authority to construct new works, comprising a pumping-station, a covered reservoir, and two aqueducts or pipe-lines, and to acquire lands and easements therefor and for the protection of the water from pollution. The Bill will contain further powers and provisions as to the supply of water.

Ossett Corporation.—Application will be made by the Corporation of Ossett for further powers in regard to their gas and water undertakings. They wish for authority to lay down mains and pipes outside their area of supply, particularly along the portion of the Wakefield to Dewsbury main road within the borough of Dewsbury, adjoining the borough of Ossett. They will also ask for authority to substitute a standard calorific value for a prescribed illuminating power of their gas. The Bill will contain further provisions with respect to the water undertaking, including the laying down of pipes in public and private streets and elsewhere, and the supply of water by measure and in bulk.

Porthcawl Urban District Council.—The Council require authority to purchase the undertaking of the Porthcawl and District Gas Company, in accordance with the provisions of the Company's Act of the past session, which was noticed in the "JOURNAL" for the 18th ult. The Bill will provide for the winding-up and dissolution of the Company, the maintenance and construction of gas-works, and the levying of rents, rates, and charges. Permission will be sought to prescribe the calorific value of the gas to be supplied by the Council, and exclude the provisions of the Gas-Works Clauses Act, 1871, relating to illuminating power. The Council require further powers in regard to the supply of water, and also authority to borrow more money.

Preston Corporation.—A General Powers Bill for which the Preston Corporation have given notice will contain a number of provisions in regard to the supply of water, including its sale in bulk or otherwise within or beyond the limits.

St. Annes-on-the-Sea Improvement.—In an Improvement Bill for which the St. Annes-on-the-Sea Urban District Council have given notice, authority will be sought for the purchase by agreement of the undertaking of the St. Annes Gas Company, with all the powers contained in the Company's Act of 1898.

Skegness Urban District Council.—Application will be made by the Skegness Urban District Council for authority to supply gas and electricity, and to acquire the undertaking of the Skegness Gaslight and Coke Company, Limited, by compulsion or agreement, and to supply gas and electricity in the urban district of Skegness and the parishes of Winthorpe and Croft, in the county of Lincoln. In the Bill, provision will be made for testing the calorific value and illuminating power of the gas, and a standard for the former will be prescribed. Further powers are required in connection with the supply of water.

Swindon Corporation.—The Corporation of Swindon will apply for authority to acquire the works and property of the Wilts and Berks Canal Company, or a portion thereof. Included therein will be the Choate reservoir of the Company, which, with their water supplies, rights, and other powers, will form part of the water undertaking of the Corporation, who will seek to have in regard to it all the powers of a local authority in relation to pleasure grounds under the Public Health Acts.

Thornaby-on-Tees Gas.—The Corporation of Thornaby-on-Tees will apply for authority to supply gas within the borough and in the parish of Stainton, manufacture gas and residual products on lands specified, and acquire, by agreement or compulsion, the works and mains of the Stockton-on-Tees Corporation within the gas limits. In the Bill to be promoted, provision will be made for acquiring lands and easements, laying mains in Middlesbrough, taking a supply of gas in bulk from iron-works, companies, or persons, entering into contracts for the supply of gas, and testing its calorific or illuminating value. Application will be made for the general powers usually conferred on local authorities supplying gas.

Walsall Corporation.—In a General Powers Bill to be promoted by the Walsall Corporation, authority will be sought to alter the existing provisions relating to the quality, pressure, and testing of gas, to prescribe the calorific value of gas supplied by the Corporation, and to exclude the provisions of the Gas-Works Clauses Act, 1871, relating to illuminating power. Further provision will be made with regard to the gas and electricity undertakings of the Corporation with respect to the following matters: The giving of notice by gas and electricity consumers before removing; the period of error in defective gas and electricity meters; the supply of gas in bulk to other local authorities, companies, or persons; power to enter premises and remove fittings; relief of the Corporation from liability to a penalty by reason of the presence in the gas supplied by them of sulphur compounds other than sulphuretted hydrogen; supply of gas or electricity where the consumer has separate supply for light or power by electricity, gas, steam, or any other source; protection of gas and electric fittings from distress; application of the existing powers of the Corporation in regard to the recovery of charges in respect of the supply of gas and electricity; attachment of gas-brackets to buildings, &c.; power to the Corporation to supply suitable gas-burners gratis in lieu of those in use.

West Gloucestershire Water.—The West Gloucestershire Water Company will apply for an extension of their limits of supply so as to include a number of places in the rural districts of Chippenham and Malmesbury, in the county of Wilts, and Tetbury, Chipping Sodbury, and Thornbury, in the county of Gloucester; and also for authority to purchase, by agreement, the water undertakings of the Tetbury Urban District Council and other authorities. Additional capital and borrowing powers will be required.

Weston-super-Mare Urban District Council.—The Council intend to apply for authority to maintain and enlarge their existing works and construct others, consisting of a pumping-station and auxiliary works at Banwell, in the rural district of Axbridge, an intake tank there, two service tanks at Weston, and several pipe-lines. Parliament will be asked to empower the Council and the Bristol Water Company to carry into effect agreements for the sale and purchase respectively of the Banwell Mills and water rights and other property of the Company at Banwell, and to confirm any agreement entered into with respect to these matters prior to the passing of the intended Act. The Bill will contain the usual provisions relating to the supply of water, including its sale in bulk.

Whitwell and District Gas.—Application will be made for the dissolution and reincorporation of the Whitwell and District Gas Company, Limited, with power to maintain the existing works, construct new ones, and supply gas in various places in the rural districts of Clown, in the county of Derby, and Kiveton Park, in the West Riding of the county of York. It is proposed to purchase by agreement the

gas undertaking of the Shireoaks Colliery Company, Limited, and of the Kiveton Park Coal Company, Limited. In the Bill, provision will be made in regard to the capital and borrowing powers of the Company, and to the amount of the capital.

Worthing Corporation.—An extension of their water limits so as to include the parishes of Durrington and Goring will be applied for by the Corporation of Worthing, who will ask to have conferred upon them in respect of these parishes the same powers with regard to the supply of water as they at present possess in their existing limits, or such variations or amendments thereof as may be contained in the intended Act. Further general water powers will be required, as well as authority to raise more money.

PROVISIONAL ORDER APPLICATIONS (SESSION 1914).

Board of Trade, under the Gas and Water Works Facilities Act, 1870.

Amersham Water.—The Amersham, Beaconsfield, and District Water-Works Company, Limited, will apply for the confirmation of their existing works and authority to construct others, consisting of a service reservoir in the parish of Amersham and a conduit extending therefrom to Beaconsfield. Further powers will be required in regard to the supply of water, and also authority to raise additional capital.

Balcombe Petrol Gas.—Application will be made by the Balcombe Gas Company for authority to generate, store, and supply petrol gas for public and private use, and to store petrol for the purpose, within the parish of Balcombe, in the county of Sussex. It is proposed to utilize for the purpose of a generating station a piece of land and a house at Bramble Hill, Balcombe; and power will be sought to lay mains and use those now existing for the distribution of the gas. The Order to be applied for will prescribe and limit the price to be charged for the gas, and authorize the Company to supply it in bulk and sell or let on hire petrol gas plant, meters, and fittings to any local authority, company, or person within their area.

Calvert (Charndon) Gas.—Application will be made by the City Oil Syndicate, of Angel Court, E.C., for power to make borings for, and produce and store, natural gas, construct works, and supply gas within parts of the parishes of Charndon and Twyford, in the county of Buckingham. The necessary authority will be required to break up streets and roads for laying mains and pipes, to supply natural gas in bulk, and to raise the necessary capital.

Dronfield Gas.—Authority will be sought by the Dronfield Gas Company for the construction and maintenance of additional gas-works. The Order will contain general provisions in regard to the supply of gas; and the Company will ask for further borrowing powers.

Dursley Gas.—The Dursley Gas Company, Limited, will apply for power to raise additional capital, and to use further lands for the manufacture and storage of gas, the conversion of residuals, &c.

East Kent Gas.—Notice has been given by Messrs. J. F. Kelley and C. B. Tully, or by a limited company to be constituted and registered under the Companies Consolidation Act, 1908, of their intention to apply for authority to construct works and supply gas within certain parishes and places in the rural districts of Elham, Eastry, Bridge, and Dover, in the county of Kent, levy rates and charges, open streets and roads for laying mains and pipes, raise capital, and enter into agreements with the promoters of the Elham Valley Gas Order, 1912.

Elham Valley Water.—The Elham Valley Water Company, Limited, wish to extend their limits so as to include Monks Horton, Sellinge, and Lympne, in the rural district of Elham, and a portion of the parish of Aldington, in the rural district of East Ashford, all in the county of Kent. Authority will be asked for this, and also for the construction of a reservoir and two pipe-lines. The general powers in regard to water supply will be required, as well as authority to raise additional capital.

Fisherton Anger and Bemerton Water.—The Fisherton Anger and Bemerton Water-Works Company desire to extend their limits so as to include the tithing of Quidhampton, in the parish of Bemerton; and they will apply for authority to do so, and to levy and recover rents and charges for such supply.

Flint Gas and Water.—Application will be made by the Flint Gas and Water Company, Limited, for authority to construct two pipe-lines in the county of Flint, and raise additional capital for the general purposes of their water undertaking, or for such other purposes as may be prescribed by the intended Order.

Garstang Gas.—An extension of their limits of supply so as to include the township of Claughton will be applied for by the Garstang Gas Company, Limited; and they will also ask for authority to raise additional capital, alter the prescribed apparatus and burner for testing the gas, and make further provisions with reference to its quality, pressure, and illuminating power.

Harpenden Gas.—The Harpenden District Gas Company desire to extend their limits of supply so as to include the parish of Wheathampstead, in the rural district of St. Albans, raise more capital, and make provisions in regard to the testing, pressure, and quality of gas.

Hayfield Gas.—Application will be made by the Hayfield Gas Company, Limited, for authority to acquire additional lands for gas-works purposes, raise more capital, and make further provision with reference to the quality, pressure, and testing of gas.

North Middlesex Gas.—Application will be made by the North Middlesex Gas Company for power to purchase additional lands by agreement, construct and maintain gas-works thereon, and apply their funds for the purpose.

Northwich Gas.—The Northwich Gas Company require power to raise additional capital, acquire certain lands for gas-works purposes, erect dwellings for the employees, and make further provisions in regard to the quality and testing of gas, the laying of pipes in streets not dedicated to public use, the supply of fittings, &c.

St. Ives (Hunts) Gas.—Application will be made by the St. Ives (Hunts) Gas Company for an extension of their limits of supply so as to include several places in the counties of Huntingdon and Cambridge, and for authority to acquire additional lands for gas-works purposes. Further capital and borrowing powers are required. Provision will be made for a repeal of the Company's Order of 1889 with respect to the quality and testing of gas and the burner and apparatus to be employed therefor; and also for the supply of gas in bulk within and beyond the limits.

Swansea Gas.—The Swansea Gas Company require authority to purchase certain lands in the parish of Llansamlet, in the county of Glamorgan, and to manufacture and store gas and residual products thereon.

Uxbridge Gas.—Additional capital and borrowing powers are required by the Uxbridge Gas Company; and in the Order for which they have given notice, they will apply for these to be granted, as well as for authority to form a special purposes fund, purchase land, and make various provisions and regulations in regard to the supply of gas.

Local Government Board, under the Public Health Act, 1875, and the Gas and Water Works Facilities Act, 1870.

Bourne Urban District Council Gas.—Application will be made by the Bourne Urban District Council for authority to purchase the undertaking of the Bourne Gas and Coke Company, Limited, carry it on and maintain the works, and supply gas within their district; also to manufacture, store, and sell residuals. The Council will ask for power to apply their existing funds and raise more money for the purposes specified.

Wokingham Corporation Gas.—The Wokingham Corporation wish for power to purchase by agreement certain lands in the parish of Wokingham Within for the purposes of their gas undertaking. Provision will be made for the amendment of their Order of 1894 with regard to the quality, testing, and pressure of gas; and it is proposed to alter the prescribed candle power and the apparatus and burner for testing, and make other provisions with regard thereto.

Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899.

Aberdeen Corporation.—The Corporation will apply for authority to charge against the revenue of the water undertaking the costs and expenses incidental to the promotion of their Water Bill of 1910.

Clydebank and District Water.—Application will be made by the Clydebank and District Water Trustees for a revival of the powers and an extension of the time specified in the Clydebank and District Water Order, 1910, for the purchase of land and the completion of works therein authorized; also for authority to borrow further money, extend and renew mains, pipes, &c., and levy and apply rates.

Dundee Corporation.—It is proposed by the Dundee Corporation to ask for an extension of the boundaries of the county and city, and for authority to apply their Acts to the added areas. The Gas Commissioners require power to purchase additional land, and use it, as well as other land in their possession, for the manufacture, purification, storage, and sale of gas and residual products.

Edinburgh and District Water.—In a comprehensive Order for which application will be made by the Edinburgh and District Water Trustees, authority will be sought for the construction of new works and the confirmation of certain existing works in the counties of Midlothian and Peebles, and for the application to them of Acts or Orders now in force. It is proposed to ask for the repeal or variation and amendment of Acts in regard to the waters in the Glencorse reservoir and the delivery of compensation water to owners; and power will be sought to convey water from the Talla reservoir and impound it in the Glencorse reservoir. Provision will be made for the supply of water for domestic use within and beyond the limits, and also for police and public purposes. Authority will be required to supply water in bulk within the counties of Midlothian, Haddington, Linlithgow, and Peebles, or some of them; to amend or repeal provisions as to the supply to Musselburgh and Dalkeith; and to cancel agreements in regard to the supply to local authorities and others.

Glasgow Corporation (Lighting and Water).—Application will be made by the Glasgow Corporation for power to alter, amend, or repeal certain provisions of the Glasgow Police Act, 1866, relating to the lighting of private streets, courts, and common stairs, to levy a new assessment for lighting purposes, and to alter the incidence of rates and charges therefor. They will also apply for power to construct water-works and other works in the parishes of Balquhidder and Callander, in the county of Perth. They comprise a dam or embankment for the purpose of enlarging Loch Voil and Loch Doine, an aqueduct to convey the waters therefrom to Loch Katrine, two new roads, a stream diversion, and a railway. Authority will be sought for abstracting the waters of the two lochs named and also of the River Balvag and the tributary streams.

Kirkcaldy Gas.—The Corporation of Kirkcaldy will seek authority to extend their area of gas supply so as to include the portion of the parish of Kirkcaldy and Dysart which lies beyond the burgh of Kirkcaldy, and the parishes of Kinghorn, Auchtertool, Kinglassie, and Markinch, and to exercise therein all the statutory powers which they now possess in regard to gas supply, or which they may acquire under the Order to be applied for.

Lanarkshire Gas.—The County Council of Lanark intend to apply for an extension and enlargement of the powers conferred by section 16 of the Burghs Gas Supply (Scotland) Act, 1876, to enable a District Committee of the county to supply gas for heating, cooking, and motive power, or for any purpose to which gas can be applied; and to provide, sell, let, hire, or deal in fittings and apparatus for any of those purposes. It is desired to extend and enlarge the powers of entry and inspection conferred by section 48 of the Act.

Charges for the Use of Subways in London.—At the meeting of the London County Council last Tuesday, the report of the Highways Committee on the proposed increase in the charges for the use of subways by gas, water, and other companies, some extracts from which were given in the "JOURNAL" last week (p. 693), was agreed to without comment.

LEGAL INTELLIGENCE.

COMPENSATION FOR PERSONAL INJURY.

Claim against the Gaslight and Coke Company.

In the King's Bench Division of the High Court of Justice last Friday, Mr. Justice ATKIN and a Common Jury had before them the case of *Colter v. Gaslight and Coke Company*.

It was an action brought to recover damages in respect of personal injury sustained through tripping over a stone slab which supported a gas-stove. On the 29th of January last, the defendants' servants replaced a stone slab by a new one, and, as was alleged, negligently allowed the new stone to project a greater distance than the old one, and beyond the doorway of the washhouse. It was stated that defendants' servants negligently failed to inform the plaintiff that the new slab projected. Defendants denied negligence and said the plaintiff had not suffered any injury.

Mr. E. WILD, K.C. (with him Mr. EDMUND BROWNE), for the plaintiff, said that in the scullery there was a cooking-stove resting on the floor, the door opening on the cooker, and the defendants, without being asked to do it, said they would like to put a new stone slab under the cooker, for the purpose of preventing danger from fire. On the afternoon of the 29th of January the workmen did the job in half-an-hour, and left the house without saying anything to indicate the sort of danger likely to arise from the way the stone had been put in.

Mr. NEILSON (with him Mr. BRIGGS), who represented the defendants, argued that there was no ground for suggesting that this stone was a "trap," inasmuch as the plaintiff knew of its existence, as she was in and out of the room while the defendants' servants were fixing it, and her husband had warned her to be careful. Though it was plaintiff's duty to exercise reasonable care, she had stated in evidence that on entering the room quickly she forgot the existence of the slab. Supposing the defendants had put up a stove in the middle of the room, and the plaintiff had got up and stumbled over it, forgetting it was there, it could not be said that the defendants were guilty of negligence in putting it where it was. In order to fix them with liability, it must be something which was dangerous in itself to a person who was keeping a proper look-out. Before the plaintiff could succeed, she must first prove negligence on the defendants' part, and next that the accident was caused by that negligence. His contention was that the accident was not caused through the defendants' negligence, but through plaintiff not looking where she was going.

After hearing the evidence, the JURY answered the questions left to them as follows :

(1) Did the defendants negligently set up the stone so as to constitute a trap to persons approaching the scullery with reasonable care ?—Yes.

(2) Was the plaintiff informed, and did she know of, or was she negligent in not knowing of, the danger caused by the stone ?—No.

(3) Even if the stone were not a trap, did the defendants negligently set up the stone so as to be a source of danger to persons approaching with reasonable care ?—Yes.

(4) Was the plaintiff, while approaching the scullery with reasonable care, injured by the defendants' negligence (*a*) if a trap, or (*b*) if not a trap but a danger ? - (*a*) No ; (*b*) Yes.

(5) Damages.—£125.

On these findings, his LORDSHIP entered judgment for the plaintiff, and refused a stay of execution.

AN ELABORATE TRADING NAME.

"The Corporation Gas Company."

At the Salford County Court last Thursday, before Judge STANGER, K.C., Daniel Donoghue, trading as the "Corporation Gas Company," Regent Road, Salford, sued Silas Dawson, of Radford Street, Kersal, for 10s. 6d., the cost of fixing an incandescent gas-burner and other accessories. According to the evidence of the plaintiff, the defendant ordered the burner to be fixed, but when an invoice was sent to him replied that the apparatus was of no use, and demanded its removal.

Mr. RYCROFT (defending) : How many of these postcards, bearing the name "Corporation Gas Company," have you had printed ?

PLAINTIFF : Twenty thousand, perhaps.

In your circulars, you speak of "our inspector" ?—Yes.

Who was the inspector in this case ?—I was. I am one of them.

Your circular says you fix the burner and mantle for 1s. 6d. How was it a bill for 10s. 6d. was sent in ?—That was for an entirely different type of thing, of more expensive make.

You call yourself the "Corporation Gas Company." What right have you to suggest that you are connected with the Salford Corporation ?—That is our trading name. That is all it is.

You speak of your "mantle-fitting department and show-rooms." You have just a little shop in Regent Road, have you not ?—Oh, no ; it is quite a big place.

When you say "inspector" on your cards you know, do you not, that the Salford Corporation Gas Department employ inspectors ?—Our address is plainly printed on the cards.

Do you still say that you were not intending to represent to the public of Salford that you were acting with the authority of the Salford Corporation ?—I say, "No."

Plaintiff concluded his evidence by stating that the fittings and mantle were in proper order when he left the defendant's house.

For the defence, it was stated that the mantle went black, and gas escaped outside the fittings. Defendant also said that, on reading the plaintiff's literature, he felt sure that he was dealing with the Corporation Gas Department. He knew that the Corporation were recommending the use of incandescent burners.

Mr. RYCROFT said there could be no question that the plaintiff's intention had been to make the public believe that it was the Salford Gas Department with whom they had been dealing. This being so, he submitted that the plaintiff's conduct should be looked at with suspicion. It was in order to expose this thing that he (Counsel) was briefed to come there that day.

The JUDGE, in giving judgment with costs for the defendant, remarked that the plaintiff calling himself the "Corporation Gas Company" might mislead people to suppose that they were dealing with the Salford Corporation Gas Department, whether there was any intention of fraud or not. Apart from this, however, the plaintiff had not fulfilled what he undertook to do in obtaining the order.

Debenture-Holders' Claim to Profits.

The question of a company being able to make profits after it had gone into liquidation was before Mr. Justice Astbury a few days ago. The Gas Economizing and Improved Light Syndicate, Limited, issued debentures entitled to a fixed 8 per cent. and to an amount of the profits as certified on the balance-sheet. On Nov. 3, 1911, a Receiver and Manager was appointed ; on Dec. 5, 1911, an order for compulsory winding-up was made ; and on March 21, 1912, the Receiver for the debenture-holders was appointed Liquidator. On March 31, 1912, and again on March 31, 1913, the Liquidator produced a balance-sheet for the year ended on that date showing a profit. The debenture-holders contended that the profit was shown in the same way as if the Company were not in liquidation ; but the shareholders, on the other hand, said the profits went to swell the assets, and could not be distributed among the debenture-holders. His Lordship, in giving his decision, said on the day of the winding-up order the Auditors ceased to exist ; and from that day the Company had no auditors. In his view, the debenture-holders were not entitled to obtain payment of this additional interest calculable on profits unless and until the profits for any year ending March 31 had been audited and shown in the audited balance-sheet. The profits in question were therefore not distributable among the debenture-holders.

Damages for Injuries through a Fall over a Chair.

In the Bow County Court last Wednesday, before his Honour Judge Smyly, K.C., William Heath, in the employ of the Poplar Borough Council, sued the Commercial Gas Company for damages for personal injuries. Mr. Abinger appeared for the plaintiff ; Mr. A. H. Hinde represented the defendants. Plaintiff stated that on the 27th of June he was hurrying from his bedroom when he stumbled over a chair which had been left outside, fell heavily, and injured his side badly. He wrote to the Company to the effect that he had met with a bad accident through the carelessness of their collector in leaving the chair where it was after it had been used by him for taking the money from the prepayment gas-meter, the padlock of which was 7 ft. 4 in. from the floor. He was laid up for six weeks, out of which he was paid by the Council full wages for two and half wages for four weeks, which he had to repay if he succeeded in his action. In cross-examination, witness said it was always necessary to use a chair to put a penny into the meter ; but as his wife was away there was no one who could do this, even with a chair. Mrs. Heath said the collector used to call once a month, and on every occasion borrowed a chair, which he would occasionally leave on the landing with the ticket. The most recent collector always put the chair back. Dr. Meadows, who saw the plaintiff after the accident, said he found him suffering from injuries to the head and bruises all over the body. Edward Langworth, a collector in the service of the Company, deposed that when he called at the house he cleared the meter without standing on anything to enable him to do so. He saw a chair on the landing, but did not use it. He had made four collections since, and had never used a chair. In cross-examination, witness denied that he had ever asked for or borrowed a chair. Herbert Bird, a collector, and John Seagrave, a meter inspector, said it was quite easy to open the meter without standing on a chair. His Honour said he thought the collector used the chair and forgot it. He considered plaintiff entitled to recover, and awarded him £15 damages, with costs on the "B" scale.

Stealing Gas at Nottingham.

A mean form of theft was revealed in a case dealt with by the Nottingham Magistrates last Tuesday, when Henry Lymberry, described as an electrician, was fined £2, with the alternative of a month's imprisonment, for stealing gas of the estimated value of 4s. 8d. The defendant in September entered into occupation of a house at Rossington Road, the previous tenant of which had been supplied with gas by the Corporation. When the latter left, the meter was "bushed ;" but it was ascertained, after prisoner had entered into occupation, that gas was being used upon the premises. After an explanation had been asked for, two of the Corporation inspectors visited the house. When they arrived, the place was in darkness. But two hours later they observed that gas was burning in the kitchen ; and upon entering the house they found the service-pipe in the cellar had been uncapped and a connection made. The prisoner, who was arrested on a warrant, admitted making the connection, but questioned whether he had consumed as much gas as he had been charged for. The Magistrates, in letting him off with a fine, took into account that this was his first offence. Theft from the Nottingham Gas Committee was presented in another form in a case which was investigated by the Magistrates on Friday, when Thomas Terry (27) and John Terry (23) were remanded on a charge of stealing money from a slot meter at the house tenanted by Terry. Suspicions were aroused through the accused changing a pound's worth of coppers for a sovereign. Defendants admitted the offence. Cases of robbing from slot meters have lately been so numerous in Nottingham that it is being seriously suggested that, in the interest of the ratepayers, the adoption of some form of burglar-proof slot appliance would repay the authorities for the extra outlay involved.

MISCELLANEOUS NEWS.

LOCAL GOVERNMENT BOARD AND PUBLICITY.

The Position of Urban District Councils.

[From the "Electrician," Nov. 28.]

It has for some time been the opinion among the more progressive municipal electricity supply undertakings that more money ought to be spent on advertising and publicity work generally. The great drawback to any scheme of this kind, however, has been the fear that such expenditure would be surcharged as illegal by the Local Government Board Auditor. A verbal decision on this question was given by the Board to the Incorporated Municipal Electrical Association some years ago; but the question has recently been raised by the British Commercial Gas Association, and a favourable reply was received. As will be seen from the correspondence which we publish below, the Associated Municipal Electrical Engineers (Greater London) have also asked for an opinion on this question, and have received the reply that what applies to gas undertakings may also be taken to apply to those supplying electricity.

Letter from the Associated Municipal Electrical Engineers (Greater London).

The Right Hon. John Burns,

President of the Local Government Board,

Whitehall, S.W.

Sir,—We understand that you recently honoured the British Commercial Gas Association by receiving a deputation from them in reference to the expenditure of money by local authorities (urban district councils) in connection with advertisements considered desirable in the interests of the gas undertakings owned by such local authorities. According to the reports in the Press, we are glad to learn that you were good enough to state that you were in full sympathy with the objects of the Association, that you considered money spent in support of its work would be money wisely spent by gas undertakings, and that if the money so spent were described as payment for "goods supplied and services rendered"—the goods supplied being the "Bulletin," the advertisements inserted by the Association in papers having a national circulation, and the samples of literature sent by the Association to its subscribers—such payments would not be made the subject of a surcharge by the Local Government Board.

May we be permitted to urge that local authorities owning electrical undertakings are equally interested? We shall be grateful if you will inform us whether we may consider your opinion to apply equally to such authorities in connection with their electrical undertakings.

I have the honour to be, Sir, yours faithfully,

Edward Calvert, Hon. Secretary.

Copies of Letters Received from the Local Government Board.

Nov. 11, 1913.

Sir,—I am directed by the Local Government Board to advert to your letter of the 27th ult., with reference to the powers of local authorities, under the general law, to incur expenditure on literature in connection with gas or electricity undertakings under their control.

With a view to explaining the legal position, I am directed to forward to you for your information the accompanying copy of a letter which the Board addressed to Sir Corbet Woodall, as President of the British Commercial Gas Association, and to state that the view expressed in the last paragraph of that letter as to the purchase of literature is applicable to local authorities owning electricity undertakings.

I am, Sir, your obedient servant,

F. J. Willis, Assistant-Secretary.

E. Calvert, Esq., Hon. Secretary,

Association of Municipal Electrical Engineers.

June 20, 1913.

Sir,—I am directed by the Local Government Board to state that they have had under consideration your letter of the 30th ult., with reference to the question of the payment by local authorities whose accounts are subject to audit by the District Auditors of subscriptions to the funds of the British Commercial Gas Association.

In reply, I am directed to state generally that the Board are not aware of any statutory provision enabling local authorities to pay subscriptions of the kind, and that the Board have no power to legalize such expenditure or to instruct the District Auditors to allow it. The Board are empowered under the Local Authorities (Expenses) Act, 1887, to sanction payments so as to obviate their disallowance by a District Auditor; but they do not consider that they could properly give a general sanction to recurring expenditure under that Act.

I am to add, however, that the Board have been advised by the Law Officers of the Crown that publications containing information so immediately connected with the discharge by a local authority of their duties as to be likely to enable them to discharge those duties more efficiently, might legally be purchased by the local authority. The question of the legality and reasonableness of expenditure incurred in the purchase of the publications would, in the case of a local authority whose accounts are subject to audit by a District Auditor, be one for consideration in the first instance by the auditor at the audit.

I am, Sir, your obedient servant,

Thos. Pitts, Assistant-Secretary.

Sir Corbet Woodall, M.Inst.C.E.

ASHBORNE ARBITRATION AWARD.

The award of the Umpire (Mr. Ernest Moon, K.C.) in the arbitration recently held to determine the price to be paid by the Urban District Council of Ashborne for the undertaking of the Ashborne and District Gas Company, has now been issued. The proceedings, which occupied three days, were reported at length in the "Journal" for Nov. 11 (p. 531) and Nov. 18 (p. 608); and from the evidence it will have been gathered that, for the Company, Mr. E. H. Stevenson and Mr. Henry Woodall put in a valuation amounting to £59,823 and £58,731 respectively; while, for the Council, Mr. J. Ferguson Bell, Mr. Edward Allen, and Mr. Frank Jones agreed that £26,926 would be a fair figure. The Umpire has awarded the Company £39,667; and in fixing this amount he stated "that he had regard to the obligations of the Council to make a further payment to the Company under section 4 subsection 2, of the Ashborne Urban District Council Gas Act, 1912, in addition to the sum awarded." This further payment includes the cost of the Company's Act of 1911, the cost of winding-up and transferring the undertaking, and certain capital expenditure

Sir Corbet Woodall, D.Sc., was Arbitrator for the Company, and Mr. Harry E. Jones for the Council; the leading Counsel for the Company being Mr C. C. Hutchinson, K.C., and for the Council Mr. Honoratus Lloyd, K.C.

ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting was held last Wednesday, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. H. D. Ellis in the chair,

The Secretary (Mr. H. J. Luff) read the notice convening the meeting; and the Directors' report—*ante*, p. 693—and the accounts were taken as read.

The Arbitration Proceedings.

The Chairman, in moving the adoption of the report and accounts, said the past year had been an interesting one—certainly it had contained one important event, which the Directors had set forth at considerable length in the second paragraph of their report. He referred to the arbitration proceedings between the Corporation and the Company. The paragraph was in itself almost complete; and he did not think he had much to add to it. But it occurred to him that the shareholders might like to hear a few of the details, and also to know something of the *dramatis personæ* in, if he might so call it, this great act. The Arbitration Court was composed as follows: The Directors selected, as the Company's Arbitrator, Mr. Gilbert Mansfield, the well-known gas expert. Their Solicitors were their old friends, Messrs. Orr, Dignam, and Co., who had acted for them in this capacity for upwards of half-a-century; and their Counsel was Mr. Buckland, who practised at the Calcutta Bar. The Corporation appointed as their Arbitrator Babu Mohini Mohun Chatterji, and their Solicitor was Babu Manilal Sen—two Indian gentlemen of the legal profession in Calcutta, of high character, and much esteemed by their fellow-citizens, both English and Indian. Their Counsel was Mr. James, also a practising barrister at the Calcutta Bar. All the preliminaries in the matter were adjusted by the end of May; and the sittings of the Court lasted through the months of June and July. Thus the shareholders would see that the proceedings were conducted with true Oriental calm and deliberation, and there was nothing about them of the hustle of the Western world. Both sides might reflect with satisfaction that they had a most thorough and painstaking trial, which had resulted in a carefully thought-out award, not a hasty, ill-considered decision, which might subsequently reveal ambiguities and imperfections. It was a matter over which both sides could rejoice. He would briefly go through the points of the award. Regarding the first point as to the question of pressures, so many in the room were gas experts, or almost gas experts, that he need not explain the matter further. But for anyone not conversant with the subject, he would say that it was necessary to give an initial high pressure, in order to secure a certain minimum at a great distance away. The Company had to maintain a minimum 2 inches pressure several miles distant (to the outward boundary) from their works, in order to accomplish which they had to ensure at the exit from the works a pressure at about 70 per cent. above the minimum required. The Corporation were of opinion that, according to the true construction of the agreement, they were not bound to pay for the gas necessarily thus supplied at a higher pressure than the minimum which the Company were under obligation to supply. This was the chief point at issue; and, as the Directors' report informed the shareholders, this point was decided in favour of the Company. Another clause of the award directed the payment of a sum in satisfaction of the Company's claims. Another clause provided for joint pressure-gauge testings by the Corporation and the Company. This very salutary arrangement would save all dispute. Another article of the award provided that the Corporation should furnish the Company with particulars of the nipples through which gas was supplied to the public, and which regulated the supply, and that the nipples should not be changed without giving the Company proper notice. This was an equitable provision. Another clause provided for the joint inspection of the Corporation fittings of the lamps, and of the Company's service pipes, stand pipes, and cocks. The last one prescribed the mode of ascertaining the consumption of gas by the Lucas lamps; payment being made for these lamps by the Corporation on that basis. Those were the six articles of the award. The Directors said in the report that they had no reason to be dissatisfied. When they said this, it was not meant that they got all they would have liked, or that they thought the Company ought to have had. Few people who went to law ever did get that. But the Corporation and the Company had now got a definite settlement of what was indefinite before, a possible source of irritation had been removed, and they had a promise of permanent peace. He could not conclude his remarks upon this momentous event in the history of the Company without bearing

testimony to the admirable spirit in which the arbitration was conducted. It was due to all engaged in it, whether arbitrator, counsel, solicitors, or officers of the two parties, that he should place on record his opinion that, while strictly discharging their duty to their principals, they showed themselves actuated by a desire (to borrow a phrase from the cricket-field) to play the game fairly, and divested of any sharp practice. He had hailed the fact with the utmost satisfaction as an augury for the realization of his ardent hope that the future relations between the Corporation and the Company (partners in the business of public lighting) might be inspired by similar high-minded and honourable sentiments, and engender mutual respect and good-will.

OPERATIONS OF THE YEAR.

Coming to the next paragraph in the report, it stated that the general operations had been fairly extensive, and it gave shareholders general particulars. The operations were less extensive than in the previous year; but they were all of the same character as those of that year, and of which he gave full particulars at their last meeting; so that there was no reason for him to go through them again step by step. But he might add this, that the additional public lamps ordered by the Corporation in the course of the year amounted in round numbers to 1000. With regard to the new private consumers in Calcutta and Howrah, they might be counted literally by many hundreds. The present position was so encouraging that the Directors had resolved to make a further reduction in the price of gas to the private consumers. All experience showed that this was good policy. They had done it before; and they were going to do it again. Mention of Howrah reminded him of one incident which would interest the shareholders. Last year he told the shareholders that the contract they had with the Municipality of Howrah was about to expire—that was, at the end of last July. Tenders were invited by the Municipality from the Electric Supply Company and themselves. The Directors sent in a very low tender—the lower of the two. Nevertheless, the higher tender of the Electric Supply Company had been accepted by the Corporation. Naturally the Directors thought that, on Aug. 1 last, Oriental gas would have ceased to shed a ray of light upon the Howrah thoroughfares. But it was not so. It seemed that the new arrangement met with obstacles, which induced the Municipality to approach the Gas Company again, with the request that they would continue the public lighting temporarily. To this request the Directors acceded. How long the arrangement was to last, they could not say. He believed it was still going on—at any rate, it was when last they heard from the other side. It was not unpleasing to find oneself figuring in the *rôle* of public benefactor; and it was very gratifying to be able to record one further illustration of the unfailing virtues and reliability of the veteran illuminant.

SHIP FIRES.

He had not intended to mention electricity; but, having mentioned it, he would say one word more. This was a matter that did not apply to Indian affairs, but was of general application. The shareholders knew that the public in this country had been painfully moved lately by the tragedies of railway accidents and burning coaches; and the electrical Press in this country had industriously but unsuccessfully attempted to fasten the responsibility for the conflagrations upon gas. Some other moving incidents had also occurred. The number of burning ships at sea had been unusually great lately; and he (the Chairman) could not help thinking that perhaps it would be desirable to inquire as to whether in some of these disasters the wiring for electric lighting had any part. On some of the huge floating "hotels" of the present day, there must be a mile or more of wiring, and fusing was quite possible. The burning of one of these huge ships would be an unparalleled catastrophe.

THE ACCOUNTS.

The next paragraph of the report dealt with the accounts, and stated that the revenue account was satisfactory. Turning to the revenue account, on the credit side, there was first the item of gas-rental, upon which he need not say anything further. Regarding the residuals, they were a very gratifying item. The amount received was £3380 more than in the corresponding period of the preceding year. Coke had done remarkably well; and an especially pleasing element was sulphate of ammonia, which was also doing well. Up to last year they had some difficulty in forging ahead with sulphate of ammonia. Now they were going ahead very well. On the other side, coals, purification, and wages were less. Salaries in India and London were more. For this, he prepared the shareholders last year. The item of mains, meters, services, and fittings was less by £2500; and the wear and tear of works was less by £1780. This did not mean there had been any starvation of the works, or any cheeseparing by their Manager. It was simply that the operations had been less, and so there had been less expenditure required. In the general expenses, there was an increase arising principally from two causes. The first was that the law costs were rather high. Law was costly everywhere; and he supposed India was no exception. The Company's law charges had been greater; but they had good value for their money in the results attained. Another item which had increased was rates. Under their old contract with the Calcutta Municipality, the Company were exempt from rates. When the new contract was in course of negotiation, the Directors endeavoured to prevail upon the Municipality to let the clause exempting the Company from rates remain; but they did not see their way to accede to the request. The Company had now to pay rates the same as other people. In result, the total expenditure had been less by £3000; and the balance was more than last year. This enabled the Directors to offer the shareholders the same dividends as they had paid for many years—viz., 4½ per cent., *plus* the 3½ per cent. interim payment, which made 8 per cent. for the year. The Directors considered this very satisfactory, under all the exceptional circumstances of the year. The next paragraph in the report stated the rate of exchange had been favourable—in point of fact, they had made a profit of just about £100 this year over the exchange.

PROSPECTS.

Reviewing the past, the Company had had their difficulties with which to contend. But these were transitory, as the shareholders would see, and were now passing into ancient history, leaving the future unclouded. They had cleared the atmosphere, and left a brighter prospect. The shareholders might like to know what he thought of the prospect. Without venturing to prophesy, and within the limits of prudence, he thought it permissible to weigh existing factors which were calculated to shape the events of the immediate future. What was the position of the Company? They had embarked on the current financial year with a public lighting contract which now clearly defined the duties, obligations, and rights of the parties. Then they had an increasing *clientèle* of private consumers; and good markets for the commodities the Company produced, and for those which they required. They were equipped, too, with good works and plant, and had a capable staff of officers. But the Directors must look well ahead. Calcutta was on the eve of enormous developments—Imperial, municipal, and commercial. An Act had been passed incorporating the Calcutta Improvement Trust, a gigantic project for the improvement and beautifying of the city, and enlarging its main thoroughfares at a cost of several million pounds sterling, which would be raised (he believed) by the Government. In addition to the Government project, there were on foot vast commercial schemes in connection with railways and docks, and other public services, all making for development, expansion, and aggrandizement of the city. A resident of many years' standing had recently expressed to him the view that Calcutta was in her infancy, compared with the enormous growth that awaited her. The transfer of the seat of government to Delhi had not disheartened her. On the contrary, it had acted as a stimulus to her determination to be always supreme in the Indian Empire—the first in trade and commerce, the first in industries and manufactures, and the first in wealth and power. These new developments would undoubtedly bring in their train new wants of all sorts. Concomitant with other new wants would arise a greater demand for light, heat, and power. The Directors would not allow the Company to be caught unprepared. If things developed according to what seemed to be the general expectation, the day might come when they would invite the shareholders to subscribe additional capital. Hitherto, by husbanding their resources, they had met all their capital requirements out of accumulated reserves of revenue; but this was a pocket which had a bottom to it. He would rather not pursue the theme any longer, because it was uncertain; and they did not know what might be on the knees of the gods behind the *purda* of the future. Let them hope that when it did emerge, it would bring them good fortune. To use a phrase of an eminent politician they must "wait and see"—but with their eyes wide open, and ever watchful.

Mr. Robert Miller seconded the motion.

Mr. Edward Clark noticed that the Company owed their bankers £19,250, and he asked whether it was only a temporary balance, and why provision had not been made for its redemption. He noticed, too, that their earning power was only £24,238; and for many years they had enjoyed 8 per cent. The capital stock was £300,000, so that obviously £24,000 was the sum they wanted. In view of additional capital expenditure, he should like to ask the Chairman whether he saw a reasonable chance for the extension of the revenue. The Company had been happily served by its administration; and they had seen their affairs brought into a thoroughly businesslike state. He also asked what was the price obtained for the public and private supplies of gas.

Mr. Martin Herzheim remarked that he understood the Chairman to say that the dividend had been earned. If he was not mistaken, they brought into the year a balance of £6000; and when the present dividend had been paid they would be carrying-forward £1500 less. If they went on like this, they would come to an end of their carry-forward.

The Chairman said that for dividend purposes companies were always entitled to fall back on their reserves, which were primarily formed for the purpose of equalizing dividends. It was true that the amount to be carried forward would be slightly reduced after paying the dividend. But the Directors were only adhering to the ordinary practice; and they had no fear for the future. The year had been a wholly exceptional and unprecedented one. They had supplied to the Municipality an enormous amount of gas for which they had not been paid; but to such a state of affairs an end had been put for ever by the award of the Arbitrators. In spite, however, of this loss, the Directors were in the position to pay the dividend. With regard to the loan, this had been rendered necessary by force of the arbtration proceedings. While the matter was pending, the Company did not get their proper payment from the Municipality; and therefore the Directors had to borrow temporarily from their bankers. The amount of the loan was covered by their investments as credited in the balance sheet. He could not forecast what was going to happen; but he approached the future with the utmost confidence. The price of gas to the Corporation for the public lamps was 2½ rupees per 1000 cubic feet. Gas was also supplied to them for other purposes, at various rates which he need not specify. As to the private consumers, two years ago the Company were supplying at 5 rupees; then they reduced the price to 4½ rupees; now they were going to drop it to 4 rupees. This, however, was subject to modification, because they had specially favourable terms for those who used gas for power and daylight heating.

Mr. Louis Penny pointed out that there was a reduction in the receipts for gas of £6000.

The Chairman pointed out that this arose partly from the non-payment by the Corporation for gas supplied above the contract minimum pressure, and partly from the fact that under the old contract the Company provided the gas and all the accessories—lighting, cleaning, extinguishing, and maintenance generally. Now they only supplied the gas; so that the figures on both sides of the revenue account were reduced by the cost of what the Corporation now defrayed for themselves.

The motion was unanimously carried.

Moved by the Chairman, and seconded by Mr. W. Williams, a dividend was declared of 4½ per cent., free of income-tax, making 8 per cent. for the year.

Mr. R. Miller moved the re-election to the Board of the Chairman, who, he mentioned, had been a Director for twenty years, four of which he had been Chairman.

Mr. A. T. EASTMAN seconded the motion, which was agreed to.

The CHAIRMAN, having responded, proposed the re-election of Mr. W. WILLIAMS.

Mr. STANLEY H. JONES seconded the proposition, which was also cordially passed.

Mr. WILLIAMS acknowledged the confidence of the shareholders.

The Auditors (Messrs. Savage and Seel) were reappointed.

The CHAIRMAN proposed a vote of thanks to the Manager in Calcutta, the Secretary, and the staffs both at home and in Calcutta. With regard to the Calcutta staff, he said they had amply and thoroughly deserved thanks this year, for they had worked hard, and more especially Mr. Snelgrove, who, in addition to the current ordinary work, had had the weight and anxiety of the arbitration on his shoulders He (the Chairman) was sorry to say it had been rather a sickly season; and several of the officers had at times—not all together—been struck down temporarily by sickness. Mr. Snelgrove had himself been indisposed. Happily, all were now in good health. At home they had their friend Mr. Luff, the same able, painstaking, and courteous Secretary they had known so many years. They hoped to see him twenty years more. There was also Mr. Rayner, their Accountant, who turned out the accounts in excellent form.

Mr. EASTMAN seconded the motion, which was unanimously carried.

Mr. LUFF replied on behalf of himself and his colleagues abroad and at home. Incidentally he mentioned that this meeting constituted his majority, for it was the twenty-first annual meeting at which he had been present as Secretary.

Moved by Mr. CLARK, and seconded by Mr. PENNY, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN replied; and this concluded the proceedings.

VALUE OF SULPHATE OF AMMONIA AS A FERTILIZER.

Propaganda Work of the Sulphate of Ammonia Committee.

At a dinner following the annual ploughing contests at Worsboro', some interesting remarks on the value of sulphate of ammonia as a fertilizer, and the work being done by the Sulphate of Ammonia Committee to extend its use, were made by Mr. F. MIDDLETON, of the Old Silkstone Collieries, Limited, at Dodworth.

Mr. MIDDLETON said it was probably known to a good many of his hearers that within the last few years rapid strides had been made in connection with the production of one of the premier artificial fertilizers—sulphate of ammonia. This had come about owing to the large increase in the number of patent bye-product coke-ovens which had been put down in this country; and in the Barnsley district this had been very pronounced. The colliery people who owned bye-product coke-ovens and were producers of sulphate were practically all members of what was known as the Sulphate of Ammonia Committee. The purpose and work of this Committee had nothing to do with fixing prices for sulphate—it being constituted entirely for the purpose of carrying on propaganda work, to extend the use and make known the utility of sulphate of ammonia among the agricultural community. It was a well-known fact that artificial fertilizers were not used in this country to anything like the same extent as they were in foreign countries. As an instance in point he cited Germany, where the annual production of sulphate of ammonia at the present time was 440,000 tons, more than 90 per cent. of which was used there. The production in the United Kingdom was 400,000 tons, and only 20 per cent. of it was used in England; the rest being exported. The primary purpose of his visit to Worsboro' was to introduce Mr. J. W. Tayleur, late Agricultural Chemist to the University College, Reading, and to the Essex County Council, who was the present agricultural expert acting on behalf of the Sulphate of Ammonia Committee. So far as colliery people were concerned in this district, their position was that they could readily dispose of the whole of their make of sulphate for export at prices as good as, or better than, those they obtained if they disposed of it locally. This position might not, however, always exist; and they were prepared to do all in their power to help and foster the distribution of sulphate of ammonia among the agricultural community in the district, if by so doing they could render some service to that community, and at the same time not prejudice their position as regarded the price of the commodity they had to dispose of. The producers of sulphate were at present subscribing to the Sulphate of Ammonia Committee 9d. per ton on the sulphate produced, for the purpose of propaganda work, and he had suggested to the Committee—and they had accepted his suggestion—that they should put down in the district ten or twelve experimental plots, so that a practical demonstration might be given of the value and utility of sulphate. These plots would be put down on farms to be selected; the fertilizers would be supplied free of charge, and the only obligation of the farmer working the plots would be to see that the sulphate was properly applied. The Committee were prepared to go still further, and give prizes of substantial amount to the three farmers showing the best results, taking into consideration the nature of the soil on which the experimental plots were worked.

Mr. TAYLEUR remarked that he did not think there could be a better argument for the use of sulphate of ammonia in the district than the fact that the first and second prizes in all the root classes that day had been obtained by two colliery companies, both of whom were large makers of sulphate of ammonia. It was necessary at the present juncture to take every means of increasing the fertility of the land; and, from what he had seen, the judicious use of sulphate of ammonia did this. He was not going to say that it was possible for this country to grow all the food that was required. But certainly the yield of cereals could be increased; and the experiment that had been made by the Sulphate of Ammonia Committee during the last three years proved that 15s. per acre spent on sulphate meant a return of 30s. when applied to cereals. As there were some £6,000,000 worth of sulphate of ammonia being produced in the country at the present time, this meant that if all that was made were used in the country, the crops would be worth another £6,000,000—surely a sum which would appeal to all practical men. In conclusion, he pointed out that the Committee undertook a large number of experiments in order to demonstrate to farmers, on their own land, the value of what he would say was comparatively an unknown manure. Mr. Middleton had suggested that the Worsboro' district should establish a series of plots; and he (the speaker) was glad to know that this had been taken up.

An interesting general discussion followed.

EDINBURGH AND LEITH CORPORATIONS GAS COMMISSIONERS.

Repudiation of Master Plumbers' Demands.

Reconstituted after the municipal elections, the Edinburgh and Leith Corporations Gas Commissioners held their first meeting on Monday of last week—Lord Provost Inches presiding. It was reported that the bad debts for the year amounted to £461, or 2s. 5½d. per £100 of charges. This was the lowest rate over the last six years, and Mr. Reid (Leith) said it reflected credit on the collectors, and also on the Treasurer (Mr. A. Canning Williams), to whose new system the result was largely due. It was further reported that Messrs. James Galloway and Son had declined to discuss matters further as to their offer for a portion of the Leith Gas-Works. Other offerers proposed to bid £10,000 for the works, convertible at their option into a feu duty of £400. But this offer the Commission declined. Mr. Lindsay (Leith) was re-appointed Convener of the Works Committee, and Mr. M'Michael (Edinburgh) was again entrusted with the convenership of the Finance and Law Committee.

The minutes of the Finance and Law Committee contained a correspondence which had passed between the Engineer (Mr. A. Masterton) and the Plumbers' Association, in regard to the agreement for fixing gas-fires, &c.; and the Committee agreed that they would not hold a conference asked for by the Association. In the course of an exhaustive report on the subject, Mr. Masterton said the suggestions made by Mr. Reekie (the Secretary of the Plumbers' Association) would mean the handing over by the Commissioners to the traders of all the results achieved by them in connection with the introduction of gas appliances among the gas-consuming public, which had been brought about by the expenditure of considerable sums of money and years of careful study of the requirements, as well as the training of a staff to deal with matters appertaining to the proper distribution and sale of gas. It was a question whether the Commissioners could consider the conceding of such drastic requests, which were unaccompanied by any proposals which would be to the ultimate benefit of the gas undertaking and the consumers. The plumbers had not carried out their part of the conditions under the present agreement, with special regard to displaying in their windows up-to-date and attractive gas apparatus. Furthermore, only two applications out of 115 plumbers on the list had as yet been made for the special trade rate for gas used for lighting, exhibiting, and demonstrating in their windows and gas departments. Again, the plumbers, as a body, had done little or nothing to push the sale of gas and gas appliances, or to foster the use of gas for domestic requirements—as witness the fact that nearly all of them had taken up the fitting of electric appliances. It was only since gas suppliers themselves throughout the whole country had been forced to take up the supply and fitting of domestic and other gas appliances, and to keep a competent staff to educate the public in the proper adjustment and utilization of same, and had given demonstrations, that any headway had been made; and if the requests of the Master Plumbers' Association were granted, they would gradually drift back into the channel of no development or progress, with corresponding loss. The policy of the Commissioners had been to encourage the work in the interests of the plumbers where consumers had expressed the least desire in this direction. On the other hand, many of the consumers preferred that the Commissioners should execute all the work and be responsible for it, knowing well that it was best in the interests of the buyer and seller. As to a demand for increased remuneration, Mr. Masterton remarked that the grounds of the application were stated to be increases in wages and materials. The latter, however, were all supplied by the Commissioners under the agreement; and with regard to wages, he understood that these had been raised from 9d. to 9½d. per hour—equal to about 5⅓ per cent. On this subject, he had had a statement prepared showing the cost of labour fitting up fires by the traders, and those fitted by the Commissioners' men. From this he found that the average cost had amounted to 8s. 1d. per fire for work done by the plumbers, against 5s. 6d. per fire by the Commissioners' men; so that there would seem to be a substantial margin of profit to the plumbers.

CO-PARTNERSHIP PENSION SCHEME AT TOTTENHAM.

In a circular issued to the staff and workmen of the Tottenham and Edmonton Gas Company, the Engineer and Manager (Mr. A. E. Broadberry) and the Secretary (Mr. E. Topley) state that the Directors have sanctioned the establishment of a co-partners' pension fund, which will be open to all co-partners under 50 years of age, and that, in order to bring it easily within the means of workmen, they have decided to allow two-thirds of the necessary contribution to be charged to the co-partnership bonus.

The circular proceeds: In many gas companies there are pension funds for the staff; but as such a fund means a contribution from members of about 3d. to 5d. per week for every 10s. of wages, it has always been felt that workmen could hardly be expected to pay such an amount from their earnings. Consequently very few gas companies have pension funds for their workmen; and where they do exist, the pensions are small. But by calling in the help of co-partnership, and so asking members for only one-third of the contribution by deduction from their wages or salary, the fund will be easily within the reach of every co-partner; and Tottenham will be the first Gas Company to

start a pension scheme applicable to workmen as well as staff. The contribution to be deducted from salaries or wages will be a minimum of 1d. up to 16s. wages per week, and about 1d. or 1½d. for each additional 8s. of wages, according to whether a member joining the fund was under or over 30 years of age. Fractions of 1d. will be disregarded and charged to the co-partnership accounts. Such a fund can, of course, only be possible by the Company making a large contribution to it.

Referring to the rules, the circular points out that co-partners over 50 years of age, although they cannot become ordinary members of the fund, can contribute 4 per cent. on their salaries or wages, and when they reach the age of 65 the Directors will, at their discretion, decide what pension shall be paid to them, having regard to all the circumstances of the case.

The years of service in calculating the superannuation are to be reckoned for present co-partners from the date they entered the service of the Company; and except in case of dishonesty, no matter whether a member leaves the Company's service, whether he dies before his pension age comes, or whether he dies soon after he begins to receive it, in no case can he lose a penny of what he has paid to the fund.

With regard to a rule that no pensions shall be payable for ten years, it is pointed out that this is necessary in order to allow the fund to accumulate money. But any man who reaches the age of 65 within the ten years, and has availed himself of the permission to subscribe, will have his case specially dealt with by the Directors.

In conclusion, the Manager and Secretary say: "We should like to point out how grandly this fund completes the series of measures the Directors have inaugurated during late years for their employees' benefit. A co-partnership employee of the Company who is a member of the Company's approved Provident Society under the National Insurance Act will now be secured on every hand. He receives free medical attendance for himself and his wife; he receives 18s. a week for 26 weeks and 9s. a week for another 13 weeks when he is ill; he receives 30s. at the birth of every child; his wife receives £15 for funeral expenses at his death, and he receives £7 10s. at the death of his wife; he receives two weeks' pay every year as holiday money; and now, to complete his security, he will, by the aid of the fund, be freed from the fear of poverty in old age, for he will, at the age of 65, if he has passed his life in the Company's service, leave it with a pension of £34 13s. 4d. for each 20s. per week salary or wages he is receiving at that date; and if he has been a careful man, and has not touched his bonus, he will also take out a good round sum in cash or stock. We doubt if there is any Company or firm whose employees are so well provided for; and we confidently hope that all co-partners will show their appreciation of this by putting in their best possible work for the business of which they are now part-proprietors.

The rules provide that the Company shall, at the end of each half year from the commencement of the fund, contribute thereto a sum equal in amount to the sum which, during the same half year, has been contributed thereto by the members, that the Directors of the Company shall be the trustees of the fund, that every member joining under the age of thirty years shall contribute throughout his membership a sum equal to 3 per cent. of his salary or wages, and every member joining at the age of thirty and upwards a sum equal to 4 per cent. The amount to which a member is entitled as pension shall be one-sixtieth of the salary or wages he is receiving at the date of his retirement for each completed year of service with the Company; but in no case shall the pension exceed two-thirds of his salary or wages. If the wages of a member have been reduced during the last six years of his service by his having, through failing health, been given work of a less remunerative character, his pension at retirement is to be calculated on the wages he was receiving immediately before such reduction.

PRICE OF GAS IN THE SOUTHGATE DISTRICT.

A meeting convened jointly by the Friern Barnet Ratepayers' Association and the New Southgate Tradesmen's Association was held last Thursday at New Southgate to protest against the price of 3s. 4d. per 1000 cubic feet charged by the Southgate and District Gas Company. Mr. Shawyer, of the above-named Ratepayers' Association, presided; and there was a large and enthusiastic attendance. The Chairman said the local Gas Company had enjoyed their monopoly since 1866, and were still taking advantage of their position to enjoy monopoly charges. The illuminating power of their gas was only 14¾ candles, against 15½ candles of other gas companies; and neighbouring districts (served by the Tottenham and Edmonton Gas Company) were getting gas at 2s. 1d., to be reduced to 2s. at the beginning of next year. The Southgate Company's price was far too high. If the works were too small, the Company should amalgamate with some larger one. A resolution was carried unanimously to the effect that the meeting was of opinion that the charges for the supply of gas in the district were exorbitant and unjustifiable compared with those of other companies serving similar districts, and recommending the Friern Barnet Ratepayers' Association to ascertain what support would be forthcoming from intending consumers with a view to inducing the North Metropolitan Electrical Power Supply Company to make the necessary provision for supplying, under the sanction of the District Council, electric light for the district.

ELECTRICITY SUPPLY IN LONDON.

Proposed Postponement of the Date of Acquisition of the Undertakings by the County Council—Projected Amalgamation Scheme.

Notice has been given of a Bill to enable the County of London Electric Supply Company, Limited, and other companies supplying electrical energy in the county of London, and the London County Council to agree to the postponement of the date at which the respective undertakings of the companies are purchasable by the Council, and to the variation of the terms of purchase. The object of the Bill, as set forth in the notice, is "to enable the County of London Company and any other or others of the London Electric Supply Companies respectively, and any one or more of such companies on the one hand and the London County Council on the other hand, to enter into and carry into effect agreements, whether conditional or otherwise, for the postponement of the date at which the Council may proceed to purchase the undertakings or parts of the undertakings of the London Electric Supply Companies or any of them, and for a variation of the terms and conditions under which such undertakings or any of them are purchasable, and making new provisions with regard thereto, including any extension of powers of purchase in reference to generating stations or portions of undertakings outside the county of London, and to provide for the validity of any such agreement, notwithstanding that the same may restrict the rights of the Council under, or may be inconsistent with or contrary to, the provisions of section 23 of the London Electric Supply Act, 1908, or any other provisions of that Act or of any other Act, and whether affecting the Company or companies parties to such agreement, or any other or others of the London Electric Supply Companies not parties to such agreement." The Bill will also sanction, confirm, and make binding any agreement or agreements already made or which may hereafter be made between the Company or any one or more of the other companies and the Council for any of the purposes referred to in the notice.

The matter was referred to at the meeting of the London County Council last Tuesday, when Major Levita asked the Chairman of the London Electricity Supply Committee (Mr. G. H. Hume) whether he had any information to give with regard to the announcement above referred to. Mr. Hume said the attention of the Committee had been directed to the notice, and the officers of the Council had been asked to report on the matter as soon as the Bill was deposited in December. Nothing could be done until then, as the notice did not necessarily afford a reliable indication as to the contents of the Bill. The Committee were not aware of what lay behind the proposals; but a paragraph recently published in the "Electrical Times" might give some indication.

In the paragraph referred to, a suggestion was made by "Meteor" that a huge amalgamation scheme, to take in all the electricity supply companies in London, would be carried out. The consequence would, he said, be the construction of generating stations on a large scale, the scrapping of all the small existing stations as soon as the first of the new ones was ready, and the use of the more important stations now in existence, at any rate for some years and until the development of the new scheme justified their discontinuance. Local authority undertakings were to be offered bulk supplies without any compulsory measures being sought to control them or their business; and if any of them were willing to transfer their undertakings to the new company, they would be offered terms which would enable them fully to discharge all their loan liabilities with probably some modest bonus for the ratepayers. The writer stated that the County of London Company had acquired an option on the old Coalite site, comprising some 23 acres between Barking Creek and the border of Dagenham; but he added that their intention to supply such districts as Romford, Grays, and Tilbury from this position would hardly justify the purchase of so much land.

BLACKBURN GAS WORKERS TO TENDER NOTICES.

A General Strike Threatened.

As reported in the last number of the "JOURNAL" (p. 693), a general strike of Corporation labourers at Blackburn appears likely, unless the demands of the men for an advance in the minimum rate of wages from 6d. to 6½d. per hour are conceded.

The Special Sub-Committee appointed to deal with the question decided not to recommend any increase in the rate of wages, but made certain overtime concessions. They also pointed out that the Corporation were already paying the full standard rate of wages. After the refusal of their request, the men passed a resolution stating that, unless the Sub-Committee's decision was reconsidered, notices should be handed in; but the Union officials urged that extreme measures should not be taken until the Sub-Committee's report had been approved by the General Purposes Committee.

At a meeting of this Committee on Monday last week, Alderman Nuttall, J.P., the Vice-Chairman of the Electricity Committee, moved that the report be confirmed; and he supported the findings of the Sub-Committee. Councillor Robinson (a Labour member) moved an amendment that an increase of ½d. per hour be granted. After alluding to the increased cost of living, he said that in the case of a public authority there was something higher expected than a mere standard rate of wages. He contended that where a higher minimum wage was paid by private firms better results had been obtained, and the employers were able to obtain the best of workmen.

The amendment was, however, defeated by 14 votes to 9. Alderman Hamer (Chairman of the Water Department) afterwards moved that the whole question be reconsidered by the Committee; but this was defeated, as was a further amendment that outdoor labourers be granted an increase of ½d. per hour on account of their being subject to weather considerations.

The position was considered at a meeting of the National Executive of the Gas Workers and General Labourers' Union held in London on Thursday afternoon, and again at a meeting of the Manchester District Executive held in the Holyoake Hall, Manchester, on Saturday evening. The conference was private, and lasted several hours; but at the conclusion, Mr. J. R. Clynes, M.P., informed our Manchester Correspondent that the Executive had decided to back up the men in their demands. "We have been trying," he said, "for a considerable time to settle something on peaceful lines; but the Corporation authorities have, so far, decided against granting any concessions." He hoped that the position would be further reviewed at a meeting of the full Council this week, and that the members would then recognize the justness of the men's claims. Asked whether notices of the gas workers

would be tendered forthwith, Mr. Clynes replied in the affirmative; stating that the usual fortnight's notices would be given on the following Wednesday (to-morrow), this, he believed, being the usual making-up day. The gas employees' notices would be tendered first, and those of other departments would follow if a settlement was not arrived at.

LANCASTER GAS MANAGERSHIP.

The Lancaster Corporation Gas Committee, after reconsidering the suggested re-arrangement regarding the managership of the gas-works, recommended to the Town Council last Wednesday that Mr. Charles Armitage (the present Manager) be appointed Consulting Engineer, at a salary of £150 per annum, and that Mr. Cecil Rhodes Armitage (the present Manager of the Morecambe Corporation Gas-Works) be appointed Engineer and Manager at a salary of £350.

Sir Norval W. Helme, M.P., moved that the recommendation of the Committee be adopted; and a lengthy discussion ensued. There were two amendments. One, that the salary of Mr. Cecil Rhodes Armitage be £300, was defeated by 16 votes to 12; and the other, deleting the recommendation from the minutes, was beaten by 18 votes to 8 – three being neutral. The minutes involving the appointment of Mr. Charles Armitage as Consulting Engineer, and his son, Mr. C. R. Armitage, as Manager were then passed. The Morecambe Corporation will require a new Gas Manager in January.

Sir N. Helme contended that the arrangement was in the interests of the borough, and would ensure a continuance of the policy which enabled Lancaster to occupy such a proud position at the head of towns in the economical production of gas, though Lancaster was paying more for coal than towns which challenged its position. Mr. Seward (the ex-Mayor), who seconded, said it would be unfair to put candidates to the expense of sending in applications, when it was settled by the Committee that Mr. Armitage, jun., should fill his father's place.

The "Wandle" in Difficulties in the Thames.—When making her way up the river last Friday, the "Wandle" (the steam collier belonging to the Wandsworth, Wimbledon, and Epsom Gas Company) did not answer her helm just after having emerged from under Blackfriars Bridge, and took a course towards the R.N.V.R. training-ship, and a collision with her stern seemed inevitable. The captain, however, managed to bring the collier up between the training-ship and the Embankment; but in her course, she swept away the boom extending at right angles from the training-ship, and grazed her side a little forward of amidships. It was not until the collier had reached mid-stream again, almost at Waterloo Bridge, that she again answered her helm.

NOTTINGHAM CORPORATION GAS FINANCE.

Some significant figures as to the money invested in the Nottingham gas undertaking are supplied, in his report on the accounts, by Mr. Leman (one of the Elective Auditors), who explains that the capital expenditure for the past year amounted to £6615, bringing the total to £1,194,545, and the net amount to £1,187,254. The revenue account showed a profit of £129,305, before making provision for interest on loans and deposits and depreciation on gas-stoves, as compared with £106,595 for the previous twelve months. This increase of £22,710 was accounted for by the larger income from the sale of gas and residual products. Mr. Leman's report goes on to note that, of eighteen corporations in the country owning gas undertakings, only one—the Stafford Corporation—shows a smaller percentage of gas unaccounted for through the mains. The receipts from residual products in Nottingham represented 10·79d. per 1000 cubic feet sold, which figure stands eleventh on the list of the eighteen corporations cited for purposes of comparison. The profit, before making provision for interest, depreciation, and sinking fund (amounting to £129,305), represents 12·14 per cent. on the capital employed, as compared with 9·87 per cent. last year. The cost of coal, including carriage, unloading, and expenses on works, was £102,023. The sale of residual products, less labour and carriage, realized £98,790, or within £3300 of the price of coal. The net profit, after making provision of £2500 for depreciation of stoves, and all contributions to sinking funds, &c., was £72,563.

Mr. Gath, the other Auditor, also refers to last year's financial results as being altogether of an unprecedented character. The total income, he points out, was equal to 3s. 5·62d. per 1000 cubic feet of gas sold—an increase of 1¾d. on the previous year; while, with a decreased expenditure, there was actually an increased profit per 1000 cubic feet of over 1¾d. Mr. Gath further alludes to the fact that £6000 was carried forward for the purpose of meeting possible increases in the prices of coal, materials, &c., and suggests that this gives the impression that no further increases in profits are to be anticipated, or that the gas department has reached its highest point.

Additional Capital for the Wandsworth, Wimbledon, and Epsom District Gas Company.—Acting under instructions from the Directors, Messrs. A. & W. Richards offered for sale, at the Mart, Tokenhouse Yard, E.C., last Tuesday, £30,000 of new ordinary stock and £10,000 of 4 per cent. debenture stock of the above-named Company. The ordinary stock ranks for a standard dividend of 3⅛ per cent., subject to the sliding-scale equally with the existing "C" stock, on which a dividend at the rate of £5 17s. 3d. per cent. per annum is being paid. It was all placed at £108 to £109 17s. 6d. per £100. The debenture stock, which is irredeemable, was sold at £90 per £100. The total amount realized by the sale was £41,442 5s.

DAVIS Fires combine PURE RADIANT HEAT with HYGIENIC EFFICIENCY.

OUR series of sixty-two modern gas fires are scientifically accurate in construction, and every one is HYGIENICALLY PERFECT—proved so by rigid test. Recommend Davis Fires to your consumers with the confident assurance that THEY BREAK DOWN EVERY PREJUDICE AGAINST GAS HEATING.

Davis Fires give well over 50 per cent. Radiant Efficiency.

NO CEMENT PACKING is used with these fires, so there can be no bye-passing of products due to cement giving way.

The Davis Gas Stove Co., Ltd.,
59, Queen Victoria St.,
LONDON, E.C.

Phone: 636 City (3 lines).

Telegrams "Degasco Cent. London."

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

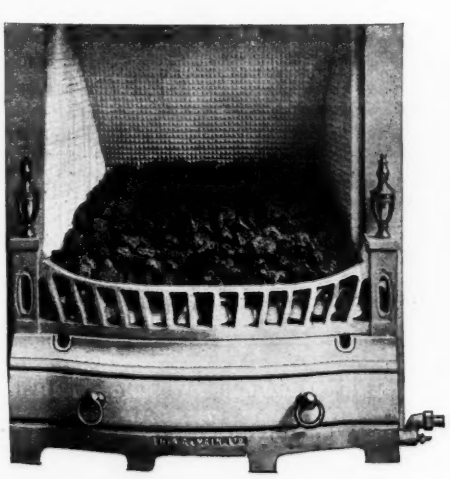
The Edinburgh and Leith Gas Commissioners have been looking into the question of their bad debts for the past year, and find that these amount to £416. This seems a large sum; but when it is stated that, as a proportion per £100 of charges, it equals 2s. 5½d. only, it does not appear nearly so bad—in fact, it is £100 better than has been known for the last six years. This is a credit to the Collector and Treasurer, Mr. A. Canning Williams, and to the new system of collection which he introduced a year ago. The Works Committee have also been discussing the question of the disposal of the old gas-works at Leith. This is an unexhausted remit of Nov. 28, 1904, which was to advise as to the disposal of the old gas-works and other properties of the Commissioners. The Committee do not appear to have proceeded very far with the sale of the works included in this remit, which is now nine years old. Negotiations have, however, been going on with Messrs. James Galloway and Sons, but these have fallen through; while another offer to bid £10,000, convertible at the inquirer's option into a feu duty of £400, has been declined.

Considerable correspondence has taken place between the Secretary of the Plumbers' Association and the Engineer to the Edinburgh and Leith Gas Commissioners, Mr. A. Masterton, regarding the handing over by the Commissioners of all the work in connection with the selling and fixing of stoves, cookers, &c. The proposal would mean that all the work which has been done by the Commissioners in the matter of educating the public into the benefits of gas for heating, cooking, &c., and instructing them in the use of such apparatus, would be handed over to the plumbers, who have meantime been idle, and done nothing in the way of popularizing gas. It is only now, when the Commissioners have spent large sums of money and trained a big staff to deal with matters appertaining to the proper distribution and sale of gas, and have obtained practical appliances, designed, regulated, and adjusted to the peculiar requirements of the district, that the master plumbers desire to step in and reap the benefit. The plumbers, both masters and men, have for some time past entirely neglected gas matters as being beneath their notice. Only two working plumbers, who were engaged by firms in Edinburgh, have attended the technical classes in this subject which have been held for the last twelve or fourteen years. This alone indicates the amount of interest shown by these people; and when compared with the number of Gas Commissioners' assistants and workmen, who have nearly all attended classes in this subject, it is quite clear that the interests of the industry are far better served by the Gas Commissioners' servants than they would be if left to the tender mercies of, and lack of knowledge held by, the plumbers. The cost to the public is also a considerable item in the question of expansion, as it is found that the average cost had amounted to 8s. 1d. per fire for work done by the plumbers, as against 5s. 6d. per fire when fitted up by the Commissioners' men. The Commissioners have all along dealt very fairly with the plumbers, both as regards putting work in their way and also as to the prices of fires, cookers, &c., which should be supplied through the plumbers. The drastic requests of the Master Plumbers' Secretary were unaccompanied by any proposals which would be to the ultimate benefit of the gas undertaking or the consumers.

Professor Vivian B. Lewes has been advertising gas apparatus in two lectures which he has delivered under the auspices of the Glasgow and West of Scotland Branch of the Smoke Abatement League of Great Britain. These lectures on smoke abatement are likely to do more good than any arranged for directly by the Gas Department, as the public will more readily attend when there is no direct evidence of advertisement. The lecturer pointed out how impossible it is to burn coal in the ordinary household grate without at the same time decomposing it and distilling off some of the volatile constituents, and, where the distillation predominates, the more injurious are the results. Besides the monetary loss due to the damage done by smoke, he also referred to the millions lost in the bye-products which are recovered when coal was so consumed. These bye-products would, of course, be available if the coal were distilled in the gas-works, and thus many valuable substances would be recovered. He also referred to coalite, and mentioned that a number of carbonizers are busy with methods of preparing fuel of this kind; but he pointed out the difficulty which all producers of such fuel have, in that gas made by such a process is of a very high candle power, and this high candle power gas is not fit for either lighting or heating, under modern conditions. He said that the public are rapidly grasping the fact that the modern gas-stove is every whit as healthy as the coal-fire, and that even if the cost is a little greater, the difference is amply made up for by the cleanliness, convenience, and even temperature that are obtained.

In Professor Lewes's second lecture, he treated more particularly on progress in the use of gas, his title being: "A Century of Work on Heating, Lighting, and Ventilation by Gas." The progress during the last ten years has been so great as almost to hide that made in the earlier days. The use of gas as a fuel and for motive power has practically levelled the load, so that the day and night consumptions are brought much closer than they used to be. Gas aids ventilation by promoting motion of the air in dwellings and workshops, and this has removed one of the great objections to gas lighting; while the gas fire has been so improved as to give out the larger portion of its heat in the form of radiant energy, which, it is agreed, is the most helpful form of heating. He next referred to the principles of the future standard for gas supply, which would be a calorific and not an illuminating one, when gas of uniform value would be supplied, at a fairly high pressure and a reduced price, which would add further to the popularity of gas as a fuel, and last, but not least, economize our rapidly decreasing store of coal, upon which the supremacy of the Empire depends. These lectures were given with all the effect of Professor Lewes's well-known manner, which carries conviction to his hearers by the bright and cheery way in which his facts are put.

The Function of the "St. Nicholas."



The primary function of the "St. Nicholas" is to convert a coal grate into a gas fire.

While this function is satisfactorily performed, the genial glow and sentimental associations of the coal fire are retained.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 8, Exchange Place, Donegall Street, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Nov.* 29.

Throughout the week the tone of the market for this article has continued dull, and it has been difficult to effect further sales without making some concession in prices. All requirements for November delivery had apparently been filled previously, and buyers have shown no keenness in purchasing for December. The nearest values at the close are £12 17s. 6d. per ton f.o.b. Hull, £12 18s. 9d. per ton f.o.b. Liverpool, and £13 per ton f.o.b. Leith. In the forward position, the views of buyers and those of most makers have remained too divergent to result in business; but it has transpired that the equivalent of £13 5s. per ton f.o.b. Liverpool has been accepted by producers for delivery in equal monthly quantities over the first half of 1914.

Nitrate of Soda.

This material is without change in either tone or value, and spot quotations are repeated at 10s. 4½d. per cwt. for 95 per cent. quality and at 10s. 7½d. for 96 per cent.

Tar Products. LONDON, *Dec.* 1.

There is no material alteration in the markets for tar products, and business is still quiet. In pitch, there has been a further slight decline at some ports, and in many instances briquette manufacturers report that they are being offered for January-June delivery at the equivalent of lower prices than those mentioned to-day. Benzol remains firm, though business is somewhat quiet. Solvent and heavy naphthas are also quiet; but there is no alteration in prices. Crude carbolic is difficult to sell unless one is willing to take a low figure. Creosote is exceedingly firm; and the inquiry is good for both prompt and forward delivery.

The average values during the week were: Tar, 27s. 9d. to 31s. 9d. Pitch, London, 40s. 6d. to 41s. 6d.; east coast, 40s. to 40s. 6d.; west coast, Manchester, 39s. 6d. to 40s.; Liverpool, 40s. to 40s. 6d.; Clyde, 41s. to 41s. 6d. Benzol, 90 per cent., naked, London, 1s. 1d. to 1s. 1½d.; North, 11½d. to 1s.; 50-90 per cent., naked, London, 1s.; North, 11d. Toluol, naked, London, 10½d. to 11d.; North, 10⅝d. to 11d. Crude naphtha, in bulk, London, 5¼d. to 5½d.; North, 5d. to 5¼d. Solvent naphtha, naked, London, 10¼d. to 10⅜d.; North, 9¼d. to 9⅜d. f.o.b. Heavy naphtha, naked, London, 10d. to 10¼d. f.o.b.; North, 9d. to 9½d. f.o.b. Creosote, in bulk, London, 3⅜d. to 3½d.; North, 3d. to 3⅛d. Heavy oils, in bulk, London, 3⅜d. to 3⅝d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. to 1s. 0½d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit; "B" quality, nominally ¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

With the close of the month there has been no increase in the demand as was expected. The tender parcels which have come into the market have been ample for any covering purposes. Outside London makes to-day are quoted at £12 5s.; Hull, £12 18s. 9d. to £13; Liverpool, £13; Leith, £13 1s. 3d.; Middlesbrough, £13.

In last week's report of the sulphate of ammonia market, the price of outside London makes was given as £12. This should have been £12 5s.

Manchester Tar Prices.

It is officially announced that the average price realized for October deliveries of tar in the Manchester district—based on the value of the products—was 34s. 10d. per ton.

COAL TRADE REPORTS.

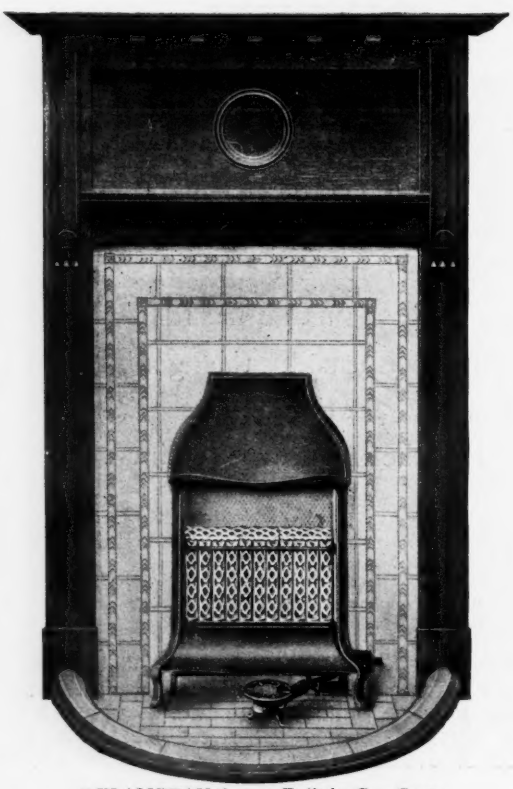
Northern Coal Trade.

There is a rather better demand for coal for prompt delivery; but forward business is only slowly entered on, at easier prices. Steam coals are rather quiet. Best Northumbrians are now quoted from 14s. 9d. to 14s. 10½d. per ton f.o.b.; second-class steams are near 12s. 8d. per ton; and steam smalls are weaker at 6s. 6d. to 8s. 6d. per ton. Some heavy contracts are now being negotiated for locomotive power purposes for next year, at prices less than those now running to completion. In the gas coal trade, the demand is keen for early supplies, and the consumption is heavy—the long contracts taking up much of the output. Best Durhams are from about 15s. 6d. per ton f.o.b.; second-class gas coals are 13s. 3d. to 13. 9d. per ton; and "Wear specials" are from about 15s. 6d. to 15s. 10d. per ton f.o.b. All classes of gas coal seem to be scarce for the next four or five weeks, in anticipation of the holiday demand; and for any quantities that are readily available, the prices named are firmly quoted. Forward lots, however, are not so firm. The exports are steadily maintained; but sales of cargoes of gas coals to some of the Mediterranean ports are at rather lower prices for the first quarter of next year. Coke is steady. Gas coke is plentiful at present, and good makes are quoted from 16s. 3d. to 17s. 3d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

There has been during the week practically no change in the conditions prevailing in the coal trade throughout Scotland, and the demand for all classes continues steady, notwithstanding the advance in prices in certain sorts. On Friday, on the Glasgow Coal Exchange, the following were the approximate figures quoted: Ell, 13s. 3d. to 13s. 9d.; splint, 13s. 3d. to 16s. 6d.; Navigations, 15s. to 17s.; Hartley, 16s. 6d.; trebles, 13s. to 13s. 3d.; doubles, 12s. 3d. to 12s. 6d.; singles, 10s. 9d. to 11s.; pearls, 9s. to 9s. 3d.; dross, 8s.—f.o.b. Glasgow.

Efficiency, Interchangeability



"FLAMBEAU" as a Built-in Gas Grate.

"PERIOD"

The method of testing the Radiant Efficiency of Gasfires generally accepted by the trade is that evolved and adopted by the Leeds University, this being recognized as a completely satisfactory method for present day requirements.

Under this test our "PERIOD" Gasfire gives an efficiency of from 58 per cent. to 60 per cent.

In addition to this high efficiency we have excellent and choice designs.

We have four distinct kinds of finish: Art Black, Art Copper, Armour Bright, and Coloured Porcellanite Enamel (in 12 shades).

The Richmond Gas Stove

Gasfire

WARRINGTON

After the Exhibition.

Mr. Norton H. Humphrys delivered one of his series of technical lectures to the employees of the Salisbury Gaslight Company, at the Assembly Rooms, last Wednesday evening. Mr. George Fullford, J.P., presided over a good attendance. The lecture had special reference to the National Gas Congress and Exhibition held in London during October. After some notice of previous exhibitions, and of the special features adopted on this occasion for the first time, attention was directed to how the gas industry has helped women, and how women have helped the gas industry, as evidenced by the large share taken by woman in the work connected with the exhibition. At the conclusion, there was a brief discussion; the speakers being the Chairman, Mr. G. Bowering, Mr. Curtis, and Mr. F. Saunders.

Principles of Gas Lighting.

At the first general meeting of the Belfast Association of Engineers for the winter session, Mr. A. M'I. Cleland lectured on the subject of the "Principles of Gas Lighting"—illustrating the progress made from 1812 to the present time by means of a number of demonstrations and experiments with various types of burners and apparatus, and showing how the best lighting duty may be developed from the gas supplied. The types of burners used when London was first lighted by gas were explained, as well as the argand and the flat-flame forms, and the Siemens type. The incandescent mantle and the bunsen burner were then described. The advent of the inverted mantle, he said, made heavier pressures possible; and experiments were then tried in the direction of increasing the pressure of the gas to two, three, or four times the ordinary town pressure, resulting in a much hotter flame and a higher light duty, until, with 80 inches pressure, as used in Donegall Place, Belfast, 80 candles per cubic foot was attained. Before concluding his lecture, Mr. Cleland gave some data of costs.

Chapel Whaley and District Gas Company.—At the ordinary general meeting of this Company last Saturday, the Directors reported that the revenue account, after providing for their allowances, showed a profit of £2274, to which had to be added the unappropriated balance of the previous year, £500; making together £2774. Against this had to be charged the bank interest, leaving for disposal £2294, which the Directors recommended should be applied in paying a dividend for the year ended Sept. 30 at the rate of 4 per cent. per annum (less tax), amounting to £1490, and in appropriating to the special purposes fund £204; making together £1694, and carrying forward the balance of £600. The Directors reported that the growth of the Company's business had continued satisfactory. Further new retorts and a new exhauster had been erected, and various minor extensions of the works carried out. The Manager (Mr. Eugene Meunier) certified that the manufacturing and storage stations had been maintained in efficient working order.

Clonmel Gas-Works Extensions.

Applications by the Clonmel Corporation for sanction to the borrowing of various loans formed the subject of a local inquiry recently. Among the sums required was £3000 for the extension and improvement of the gas-works; and, in regard to this matter, it was stated that some portion of the scheme had already been carried out. The total cost would be £4300; but there was £370 in hand from a previous loan, and £930 would be taken from the reserve fund. Since the Corporation took possession of the works, in 1896, they have been paying on an average £800 a year to the rates. The Manager (Mr. R. Kneeshaw) said the consumption on a winter's day had been 140,000 cubic feet; and they had storage for about 100,000 feet. There was a prospect of a further growth in the consumption. In 1899 the price of gas was 5s. per 1000 cubic feet for lighting and 4s. 2d. for engines; now it was only 4s. 9d. and 3s. 11d. It was impossible at present to meet the demand. Mr. Henry O'Connor, who is Consulting Engineer to the Gas Committee, stated that the retorts were very antiquated, and unable to extract the proper amount of gas from the coal. He estimated that the additional quantity of gas obtainable with the new retorts would represent the equivalent of a reduction of 4s. per ton in the price of coal, on the present consumption. In addition, there would be a substantial saving of fuel used in the furnaces. He indicated other desirable alterations, and said he calculated the total saving to be realized by the scheme would be £922, which, allowing 6 per cent. for interest and sinking fund on the new loan, would mean a gain of £714, or over 6d. per 1000 cubic feet of gas sold (26 million feet). A reduction in the price of gas would lead to a big increase in the number of consumers. Mr. O'Connor then proceeded to give the Inspector details of his estimate of the works—amounting to £4300.

Ilfracombe Gas Company.—We regret that the particulars given under this heading on p. 700 of last week's "JOURNAL," which were furnished by an Exeter correspondent, referred to the Ilfracombe Hotel Company, and not to the Gas Company, as he erroneously stated.

Buenos Ayres Water-Works Company, Limited.—The accounts for the year ended the 30th of June last, which will be presented at the general meeting of shareholders on Thursday, show that the profit was £23,307. Adding the balance brought forward, there was produced a total of £27,390, which the Directors recommended should be appropriated as follows: Preference dividend (5 per cent.), £7500; ordinary dividend (interim at the rate of 2 per cent. and final at the rate of 4 per cent.), £13,200; and contingency account, £1000—leaving £5690 to be carried forward. The Directors report the continued steady increase in the Company's business; the number of services in operation on June 30 last being 10,306, compared with 8816 at the corresponding date in 1912. The Company's area has been enlarged, and plans have been prepared by the Engineer for extensions involving 220 kilometres of new mains. To meet this outlay, it is proposed to raise additional capital to the amount of £230,000.

& Silence of RICHMOND'S

GASFIRES.

We have four fire widths in each of the running and most popular patterns, and we have an improved gas-air injector which ensures SILENCE in burning.

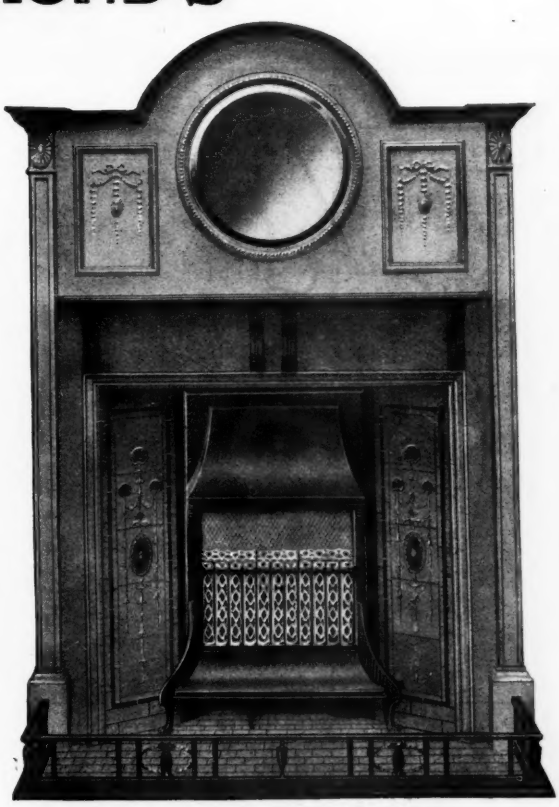
Each part is easily removable for cleaning and interchangeable throughout, fire with fire.

These good points all go to make up a series of Gasfires meeting every requirement for harmony in design, finish, size, colour, and efficiency, and will recommend themselves to you as buyers and distributors of High Grade articles.

& Meter Co., Limited,

Specialists.

and LONDON.



"LOUIS" in front of a Coal Fire Grate.

Forecast of an Electrical Development.

In his presidential address to the Manchester Association of Students of the Institution of Civil Engineers last Wednesday, Mr. S. L. Pearce, the City Electrical Engineer, gave some details of a development in electric lighting; stating that "before the end of the year there will be on the market lamps known as the half-watt lamps. Tungsten filaments are to be retained; but the globes of the lamps are to be filled with some inert gas—probably nitrogen." Mr. Pearce proceeded to say that this was a somewhat comforting reflection for electricity supply undertakings, who in the course of the past four or five years "have seen their lighting revenues diminish by some 70 per cent., and are now threatened with a further diminution of 50 per cent." In a subsequent part of the address, Mr. Pearce referred to the possibilities of the gas-engine; remarking that there was a good deal to be said for the combination of gas and steam power-houses. The gas plants, he said, could operate on the long hour loads, and the steam-turbine plants on the peaks. This, he ventured to say, was the way of true progress; and if it was possible for the electricity supply authorities to obtain their gas ready for use in the engines at a figure comparable with what it would cost to obtain it themselves from their own producers—due allowance being made for all differences in calorific values—and also at such a price as would show a saving in the fuel costs, this course could be adopted with advantage. "In this connection," Mr. Pearce added, "it may be of interest to state that serious efforts have been made in Manchester by the gas and electricity authorities to arrive at a working basis of advantage to both departments of the Corporation."

Street-Lamp Breakages in Dublin.—The Lighting Committee of the Dublin Corporation have reported that during the recent labour disturbances in the city upwards of 250 street-lamps were broken, and that between 700 and 800 panes of glass had to be replaced; while renewals were necessary, in many instances, of lanterns, burners, reflectors, and other fittings.

Paris Water Supply.—We learn from the Engineering Supplement to "The Times" that, in order to provide an additional water supply for Paris, a scheme is under consideration for conveying the underground waters from the region of the Vals de Loire to the city. The Vals de Loire extend between Nevers and Briare for about 54 miles, the width varying from 330 feet to 1¾ miles, and consist of alluvial sands lying on compact ground. Preliminary trials have indicated the existence of a water-bearing area containing about 110,000 million gallons; the underground water coming chiefly from the Loire. The scheme contemplates the erection of reservoir dams which would be capable of impounding large quantities of water during the period when it is rising, and would permit the restoration to the river of a volume of water; thus raising it during the summer to a higher level. The scheme is one of three upon which the Paris authorities will shortly have to come to a decision.

Rhondda and the Coke-Oven Gas Scheme.

It has already been announced that negotiations between the Rhondda Urban District Council and the Cambrian Combine, for a supply of coke-oven gas, have fallen through, on the question of price; and the "South Wales Daily News" says this intimation came somewhat as a surprise to the average ratepayer. To make the matter clear to those concerned, the following explanation is now given: The offer of the Combine was to supply the Council with purified gas at 7⅛d. per 1000 cubic feet; and inasmuch as the selling price of gas in the district to the ordinary consumer is 4s. 3d. per 1000 feet, and to the slot consumer over 5s., it was thought that the offer was an exceptionally attractive one. There are, however, factors in the situation, which are not at once apparent, to tend to minimize the value of the offer. Although the actual selling price of gas is over 4s., this is not the figure which should be compared with the 7⅛d.; and after allowing for particularly heavy capital charges and mains maintenance—also a heavy item in a district subject to subsidence—the net cost of manufacturing gas is about 1s. 6d. per 1000 cubic feet. Even then this figure cannot be used for purposes of comparison with the 7⅛d. The supply is at present under the Council's own control; whereas had they accepted the Combine offer, they would have required guarantees as to constancy and quality of supply which might have been difficult of fulfilment. In addition, it would have been necessary to lay down certain works and mains for the adaptation of the Company's supply to the Council's mains, which would have meant considerable capital expenditure—estimated at £15,000—to have been added to the cost of the colliery supply. It was considered that the saving to the Council would have been practically infinitesimal when all the factors were considered.

Chertsey Gas Company.—At the annual meeting of this Company Wednesday last, the Chairman (Mr. W. Moir) announced that the balance of net revenue was £3885; and, after providing the statutory dividends, there was a balance of £1732. The Directors congratulated the shareholders on the increased prosperity of the Company, and recommended the declaration of dividends of 12, 9, and 5 per cent. respectively (less income-tax); and this was agreed to.

Lighting of Brymbo.—A number of the parishioners of Brymbo met in the Council Schools on Monday last week to receive a report from the Parish Council with reference to the lighting of the ward, and to fix the rate to be levied. The Lighting and Watching Act was adopted at a parish meeting held in August. The scheme proposed was for the public lighting of the ward by electric power from the Brymbo Steel Company, and the Parish Council were instructed to proceed with the scheme. A new development, however, took place at the meeting, when it was decided to adjourn in order to ascertain whether the Wrexham Gas Company would extend their mains to Brymbo.

Liverpool and the Widnes Water Supply.

A Local Government Board inquiry was held at Widnes last Tuesday, with reference to an application by the Corporation for sanction to borrow £20,000 for water-works extensions at Netherley. It was stated that by an Act of 1880, there was an agreement entered into between Liverpool and Widnes to the effect that, when necessary, Widnes could, upon certain notice, demand a supply of 2 million gallons of water a day from the Vyrnwy connection. There was no suggestion binding Widnes to take water. Similar agreements were made by Liverpool with St. Helens and Warrington. Mr. E. W. Pearce, on behalf of Liverpool, said it had been suggested that Widnes had a supply of its own for all time, and was never likely to ask Liverpool for water; and, this being so, he did not see the necessity for Liverpool to hoard up a large quantity to satisfy any possibility of a demand from Widnes, when they could make use of it elsewhere. Liverpool was approaching the time when it might become necessary to lay a third line to Vyrnwy. He asked the Local Government Board that, if sanction to borrow the money was granted, Liverpool should be released from the agreement. Widnes had not carried out the obligation which the agreement implied to take a supply of water. Mr. Isaac Carr (Gas and Water Engineer to the Corporation) gave evidence; and the Inspector then adjourned the inquiry for the purpose of consulting the Local Government Board upon the question as to whether or not the agreement could be nullified.

Reduction in Price at Hayle.—Mr. Vivian presided at the annual meeting of the Hayle Gas Company last Wednesday, and congratulated the shareholders on the increasing prosperity of the undertaking. The net profit for the year ended Sept. 30 last was £964, as against £963 last year, notwithstanding a loss of £108 in revenue through the reduction in the price of gas and a rise in the cost of coal. It had, he said, been decided to reduce the price of gas by a further 3d. per 1000 cubic feet—making the cost from Jan. 1 next 4s. 6d. for lighting and 3s. 6d. for other purposes. It was resolved to pay a dividend of 5 per cent., and out of the balance to carry £246 to the depreciation fund.

Suggested Gas-Works Purchase at Inverkeithing.—A special meeting of the Inverkeithing Town Council was held last Thursday evening, for the purpose of further considering a proposal to adopt the Burghs (Scotland) Gas Supply Act. Mr. Robertson, in moving that the Act be adopted, said that by doing so they would not commit themselves in any way so far as the purchase of the gas-works was concerned. It did not mean that they were compelled to go on and purchase at any price. They could leave it to a Committee to have a "preliminary canter" with the Gas Company, to see if there was a possibility of coming to a settlement in the matter. At the end of a long discussion, the motion was withdrawn, and a Committee appointed to negotiate with the Directors of the Company. An adjourned meeting of the Council was arranged for.

Galvanized Iron for Water-Pipes.

There has been further correspondence on this subject in "The Sanitary Record and Municipal Engineering." Mr. C. Clemesha Smith, M.Inst.C.E., the Water Engineer of the Wakefield Corporation, and the President of the Institution of Water Engineers, says: "Having had experience with water which in its raw state is highly plumbo-solvent, I have had impressed upon me the fact that the use of wrought-iron pipes, whether plain, galvanized, or otherwise protected, is inadvisable for the conveyance of acid water. I found that in some instances galvanized pipes were so corroded as to be useless in two or three years, and that plain wrought-iron pipes lasted several years longer. When the water passing through the pipes is alkaline, the position is reversed, and galvanized pipes last longer than plain wrought-iron pipes. When galvanized iron cisterns were used to hold an acid water, the sides of the cisterns were quickly corroded through; the action of the water appearing to be more rapid in the presence of air. I have found that when such cisterns were used for a water which had been treated so as to neutralize the acid and rendered faintly alkaline, a white precipitate was occasionally formed about the water-line on the sides of the cistern. On analysis, the precipitate proved to be a hydrated oxide of zinc. In all the above cases I am alluding to cold-water pipes and cisterns. Under the most favourable circumstances, the life of galvanized iron pipes is much shorter than that of lead pipes; and as it is generally agreed that it is desirable to treat acid or plumbo-solvent water so as to neutralize the acidity and remove the affinity for lead (such treatment being carried out at little cost), there is no reason why lead pipes should not be used."

Chippenham District Water Supply.—At a recent meeting of the Chippenham Rural District Council, Mr. T. J. Moss-Flower, Assoc. M.Inst.C.E., explained the scheme of water supply he had, in co-operation with Mr. A. H. Lapham, the Council's Surveyor, prepared for supplying a large part of the area with water. The scheme involves the sinking of a deep well and boring, provision of engines and pumps, laying a cast-iron rising main some 2¼ miles long, construction of a large storage reservoir, and some 12 to 14 miles of distributing mains. The scheme was adopted by the Council, and instructions were given for the making of the necessary boring.

The Lighting of Private Roads.—A discussion took place at the meeting of the Totnes Town Council last Tuesday on the question of the lighting of private roads in the borough. A Committee recommended that a contribution of £1 be made towards the cost of placing a lamp in one road which has not been dedicated to the public, though there are several houses in it. In support of the proposal, it was pointed out that the occupiers of the houses are ratepayers, and that if such houses were to be occupied, and residents attracted to the town, the comfort and convenience of the people should be studied. Some councillors, however, thought it a dangerous precedent to light private streets; and the recommendation was rejected by a majority.

THE PIONEERS of RADIANT HEAT

—the first gas fires made upon the pillar fuel principle—the first to be fitted with Gas Regulators or Adjustable Nipples.

WELSBACH
KERN
GAS RADIATORS

have revolutionized gas fire construction.

"The Tale of a Little Lost Dog" is a new booklet dealing with the Radiators, based on a novel idea and full of good selling talk. May we forward you a supply?

THE WELSBACH LIGHT CO., LTD.,
WELSBACH HOUSE, KING'S CROSS,
LONDON, W.C.

And at BIRMINGHAM, MANCHESTER, LEEDS, HANLEY, HULL, BRISTOL, & DUBLIN.

Use only Welsbach Mantles, Upright (C, CX, & PLAISSETTY), & INVERTED.

NEW DESIGN 1 S.

Write for the New Radiator Catalogue containing all particulars of nearly 50 models—including a range of entirely new designs.

Wages Question at Leeds.

Applications sent in by the employees for an all-round advance in wages of 2s. per week were considered by several of the Leeds Corporation Committees last Tuesday. As to the 166 lamplighters, the Street Lighting Committee agreed, subject to the approval of the Council, to increase the minimum wage to 26s. 6d. per week and the maximum (attainable after twelve months' service) to 28s. 6d. The result is that 144 men will have their wages raised immediately from 27s. 6d. to 28s. 6d., while the remaining dozen will be raised from 27s. to the maximum. The wages of a dozen arc lamp trimmers were raised from about 27s. a week—payment has hitherto been at the rate of 6½d per hour—to 28s. 6d. The Gas Committee, who employ 1000 men, had a long sitting. All the afternoon was taken up with receiving deputations representing various sections of the men. After the deputations had withdrawn, the applications were considered; and it was decided to recommend the Council to bring the wages of the labourers to one standard. The net effect of this will be that in some cases the men will get all they have asked for, while as regards the remainder the advances will not be so great. In grades apart from labourers, the advances vary from 1s. to 2s. The Committee were guided by the wages paid in other centres; and they are now satisfied that the concessions made will bring Leeds among the cities which pay their employees on the best scale. The claims of those men who have recently received advances in wages were not taken into consideration. The Water Committee have granted advances to 57 labourers, and also to stokers and enginemen, of 2s. and 1s. per week respectively.

Vertical Retorts for Chorley.—At a meeting of the Chorley Town Council last Thursday, it was decided to apply to the Local Government Board for sanction to borrow £18,000 for vertical retorts.

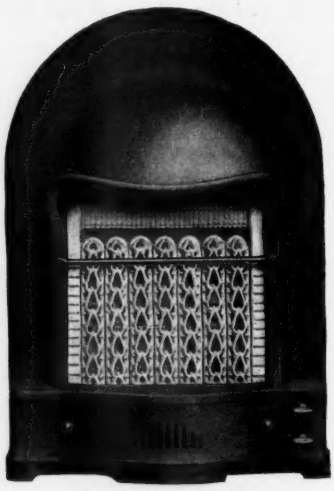
Electric Light Failures.—A partial failure of the electricity supply at Warrington occurred on Friday night, when one of the main cables serving the centre of the town broke; the result being that many of the shops in the principal thoroughfares were plunged in darkness. Those who had not a reserve gas supply had recourse to illumination by candles. The local library and reading room, infirmary, and police station were affected by the breakdown. For ten minutes there was confusion everywhere in Richmond (Surrey) last Tuesday night; the electric light going out at half-past six owing to a mishap at the generating station. There were many people in the shops, and something like a panic occurred in the larger places of business as the customers endeavoured to grope their way in the darkness into the streets. Candles and oil-lamps were hastily lighted, and there was general relief that the current was restored so soon.

Cork's Polluted Water Supply.—Considerable alarm has arisen in Cork by reason of the further reports of pollution in the water supply which were furnished at last week's meeting of the Public Health Committee by Professor Moore, Dr. Donovan (Superintendent Medical Officer of Health), and Mr. D. J. Mahony (Public Analyst). Professor Moore stated that it was evident the filtration process was incomplete; and Dr. Donovan, recalling a report of last year by Mr. Sandeman, in which proper filtration was recommended, urged that the authorities should not wait until they had had "a rude awakening." He suggested that, in the meantime, the water should be boiled before being used. Mr. Mahony referred to the polluted character of samples of water taken at various places. The City Engineer (Mr. Delaney) said that the reports gave them data on which a proper investigation could be made; and, on his suggestion, it was agreed that they should be considered by a special meeting of the Joint Committee of the Public Health and Water-Works Committee which has been appointed in regard to the quality of the water supply.

Connecting Two Supply Areas.—The "Sanitary Record and Municipal Engineering" last Friday referred to a dispute which arose some months ago between the Battersea Borough Council and the County of London Electric Supply Company, Limited, on the subject of the right of the Company to open streets. It was contended by the Highway Authority, in an action brought by them to restrain the Company from breaking-up streets for the purpose of making fresh connection between two areas already connected, that their Statute only authorized one connection between two areas. It was, however, submitted by the Company (1) that, by virtue of sec. 1 of the Act of 1889 ("words in the singular shall include the plural"), the expression "a connection," must be interpreted as "connections;" (2) that, by virtue of section 32 of that Act ("where an Act passed after the commencement of this Act confers a power or imposes a duty, then unless the contrary intention appears, the power may be exercised and the duty shall be performed from time to time as occasion requires"), connections might be made from time to time; and (3) that, apart from the Act of 1889, their Statute authorized such connections between areas. The Court held that the third contention prevailed.

At a meeting of the Wirksworth Urban District Council last week, it was reported that the Lighting Committee had recommended the expenditure of £160 on automatic lighters for the public lamps; and this was approved by the Council.

The model public-house which the Gaslight and Coke Company allowed to be erected on their property in East Ham is being held up as a good example to the London County Council. The success of this house, opened and managed by the Public House Trust, is recorded with the object of inducing the County Council to agree to a similar place being opened on the Tabard Street housing estate. It is pointed out, in a report by the Housing Committee on the *agenda* for to-day's meeting, that this East Ham public-house, called the "Lightship Inn," under Trust management, had become of great value to the men employed at the gas-works; that they had used it in considerable numbers for their regular meals, and that excessive drinking was unknown. Though the Trust has several of its model houses in the Home Counties and this one in East Ham, it has none actually in London, and therefore is anxious to run such a place in the Metropolis. The idea is simple. Though all drinks are sold, alcoholic liquors are not pushed—the Managers relying principally for their living by commission on the sale of non-intoxicating commodities.



The "RATCLIFF."

A SELF CONTAINED FIRE

complete with all accessories and possessing many special features.

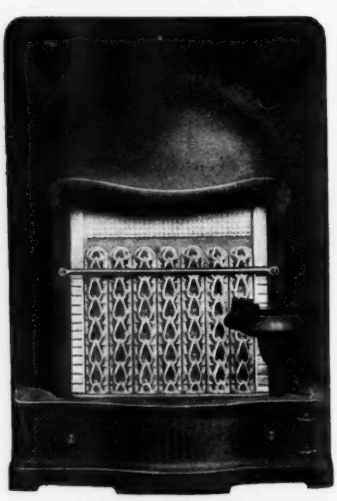
PARKINSON'S RATCLIFF & EDMUND FIRES

10 in. and 13 in. Fire openings.

10 in. FIRE price 25s. INCLUDING TAP.

THE PARKINSON STOVE CO., LTD.,

BIRMINGHAM & LONDON.



The "EDMUND"
fitted with Removable Side Boiling Burner.

The Directors of the Power Gas Corporation announce a dividend of 5 per cent. per annum, less tax, compared with 4 per cent. a year ago.

Mr. W. J. Place sold last week, at his rooms in Nottingham, 178 shares (£10) in the Shirebrook and District Gas Company at from £19 1s. to £19 12s. 6d. each.

At the meeting of the Lancaster Town Council last Wednesday, the tender of Messrs. Gibbons Bros., of Dudley, amounting to £3900, was accepted for the pulling down and rebuilding of a retort-bench, part of a scheme of general reconstruction.

The inaugural meeting of the newly-elected Slamannan Parish Council will take place shortly; and it is believed that among the first business will be a discussion on the better lighting of the district, and preliminaries to the ultimate purchase of the gas-works.

During the municipal year ending last month, the gas consumption in the city of Bradford showed an increase of 7 per cent. on the preceding year. The extra demand has rendered it necessary that extensions shall be made. The installation of new vertical retorts at the Thornton Road works of the Corporation has proved successful; and suggestions are made that the Birkshall works shall be similarly augmented.

Owing to a failure in the boiler plant at the generating station, the electric light in Broughty Ferry went out on Monday evening of last week; and the inconvenience, according to local reports, extended to the street gas-lamps. The explanation given of the latter fact is that the booster operating the lighting and extinguishing system being driven by electricity, the machinery was at a standstill just when the lamps should have been lit up. The inconvenience, so far as electric lamps were concerned, was of lengthy duration; but the gas-lamps, fortunately, needed no more than the services of the lamplighter.

APPLICATIONS FOR LETTERS PATENT.

RESTORATION OF LAPSED PATENT.

Notice is given that an order was made on Nov. 20, restoring the letters patent granted to EDWARD TEMPLE for "Improvements in and relating to washing or purifying apparatus for use in gas generating plants"—No. 25,736 of 1908.

26,324.—BEARD, G. F. H., SCOTT, J. W., and R. & J. DEMPSTER, LTD., "Condensers." Nov. 17.

26,331-2.—STIMSON, E. F., "Gas-heated circulators." Nov. 17.

26,333.—LEWIS, F. C., and STIMSON, E. F., "Cut-out valve." Nov. 17.

26,474.—TILLEY, F. C., "Inverted mantles." Nov. 18.

26,496.—BERRY, A. F., "Meters." Nov. 18.

26,497.—BERRY, A. F., "Gas cooking-ovens." Nov. 18.

26,572.—MEIER, E., "Stopping supply of liquid to pipes upon breaking." Nov. 19.

26,604.—SELAS LIGHTING COMPANY, LTD., and TURNER, E., "Compressors." Nov. 19.

26,625.—HAAN, I. DE, "Bunsen burners." Nov. 19.

26,634.—ALTMAN, J., and WHOLESALE FITTINGS COMPANY, LTD., "Air regulators for burners." Nov. 19.

26,648.—CLARK, J. G., "Spectacles for observing sources of radiation." Nov. 20.

26,843.—HARDING, F. R., "Valve operating mechanism." Nov. 22.

26,919.—KIRKHAM, HULETT, AND CHANDLER, LTD., and REESON, J. N., "Rotary gas washers or scrubbers." Nov. 22.

26,930.—COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATERIEL D'USINES À GAZ, "Rotary pumps and motors." Nov. 22.

GAS COMPANIES' STOCK AND SHARE LIST.

There was a distinct improvement in the general tone of things on the Stock Exchange last week. The old bogeys—Mexico and Labour—though not actually laid, were in abeyance, and ceased awhile from troubling. And that shy bird, the public, which has not ventured into Capel Court very much lately, gave signs of returning courage. The most attractive quarter was the Railway Market, where the low prices were almost irresistible; and this was the strongest of the week, though several others did pretty well. If home politics were not in such a tangle, all might be well. At the opening, markets in general looked cheerful, disquieting factors being temporarily quiescent; and prices began to harden. Consols did not move; but Home Rails were well supported and advanced. Transatlantics were better; and Foreign very fair. Tuesday brought a considerable improvement all round; the general outlook (including arrangements for the fortnightly settlement) being favourable. All markets were stronger and more active. Consols had a big jump of ½, Rails made smart advances, and Transatlantics (aided by Wall Street) were in good demand. On Wednesday, markets opened very confident, and set about pushing further advances. After a while, buying tailed-off, and progress was checked; but the closing figures showed advances. Thursday fell very quiet, and things were not so strong all round. Consols fell ⅛; but Rails continued to do well. The Foreign Market was firm; but Americans suffered from Wall Street being closed. On Friday, business died away almost to nothing, markets gave way for lack of support, and prices eased down. Consols lost ⅛ for money and gained ⅛ for the account. Rails suffered from profit-snatching after recent advances, and other departments were weaker. But Saturday put a better complexion upon things. After a rather poor opening, markets brightened up, and some became really almost active. Rails were specially conspicuous. Consols closed unchanged at 72⅞ to 73⅛—a rise of ¼ in the week. In the Money Market, short loans were in good demand at firm rates, but discount moved easier. Business in the Gas Market was unusually quiet—almost like an August week—but transactions (such as they were) were more evenly distributed among the issues. Prices were very firm, and several quotations advanced. In Gaslight and Coke, the ordinary had not more than a dozen transactions altogether, and none at all on Friday and Saturday. Prices ranged from 102⅜ to 103¾. In the secured issues, the maximum realized from 74⅜ to 76, the preference 95½, and the debenture 73½ and 74. South Metropolitan was ½ stronger at 108¾ to 110; and the debenture marked 72½ and 74. In Commercials, the 4 per cent. changed hands at 106, and the 3½ per cent. at 103. Among the Suburban and Provincial group, Alliance and Dublin was done at 55 to 60 (a rise of 4), Brentford old at 263, ditto new at 204 and 204¾, British at 45, South Suburban at 116½, Tottenham "A" at 138⅛ to 139½ and ditto "B" at 115⅝ to 116⅛—a rise of 1 in each. In the Continental companies, Imperial marked 163 to 166 (a rise of 2), Union 80⅛ to 83 (a rise of 2), ditto preference 124½ to 125½, and European 17⅛ to 17⅝. Among the undertakings of the remoter world, Buenos Ayres was done at 90⅛ and 91, Melbourne at 98¾, Primitiva at 5 11/16 to 6, ditto preference at 4 13/16 to 5, and San Paulo debenture at 50¼.

Issue.	Share.	When ex-Dividend.	Dividend or Interest & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 15	4	Alliance & Dublin Ord.	58–61	+4	6 11 2
374,000	,,	July 11	4	Do. 4 p.c. Deb.	80–83	..	4 16 5
380,000	5	Oct. 15	7½	Bombay, Ltd.	6–6½	..	5 15 5
50,000	10	Aug. 28	15	Bourne- mouth Gas & Water	10 p.c.	28¼–29½	.. 5 2 2
					B 7 p.c.	14½–15½	.. 4 11 10
347,500	10	,,	7		Pref. 6 p.c.	13½–13⅞	.. 4 7 8
75,000	10	,,	6				
380,000	Stk.	Aug. 14	14	Brentford Consolidated		262–267	.. 5 4 10
330,000	,,	,,	11	Do. New		203–203	.. 5 5 9
50,000	,,	,,	5	Do. 5 p.c. Pref.		111–113	.. 4 8 6
206,250	,,	June 13	4	Do. 4 p.c. Deb.		94–96	.. 4 3 4
317,380	Stk.	Aug. 28	11	Brighton & Hove Orig.		201–206	.. 5 6 10
244,200	,,	,,	8	Do. A Ord. Stk.		149–152	.. 5 5 3
530,000	20	Sept. 26	12½	British		44½–45½	.. 5 9 11
120,000	Stk.	June 27	4	Do. 4 p.c. Deb. Stk.		87–89	.. 4 9 11
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.		89½–91½	.. 4 7 5
100,000	10	—	—	Cape Town & Dis., Ltd.		2–3	.. —
100,000	10	—	—	Do. 4½ p.c. Pref.		3–5	.. —
100,000	Stk.	June 27	4½	Do. 4½ p.c. Deb. Stk.		75–80	.. 5 12 6
157,150	Stk.	Aug. 14	5	Chester 5 p.c. Ord.		109–111	.. 4 10 1
1,513,280	Stk.	Aug. 28	5/3.4	Commercial 4 p.c. Stk.		105½–107½	+ ½ 5 1 7
560,000	,,	,,	5⅛	Do. 3½ p.c. do.		102½–104½	+ ⅝ 5 2 0
475,000	,,	June 13	8	Do. 3 p.c. Deb. Stk.		71½–73½	4 1 8
800,000	Stk.	,,	4½	Continental Union, Ltd.		81–84	+2 5 7 2
200,000	,,	,,	⅞	Do. 7 p.c. Pref.		124–126	.. 5 11 1
492,270	Stk.	—	[illegible]	Derby Con. Stk.		123–125	.. 4 12 0
55,000	,,	—	4	Do. Deb. Stk.		102–104	.. 3 16 11
1,002,180	10	July 30	10	European, Ltd.		17½–18½	.. 5 8 1
16,386,660	Stk.	Aug. 14	4/17/4	Gas-light & Coke	4 p.c. Ord.	102–104	.. 4 13 8
2,600,000	,,	,,	3½		3½ p.c. max.	74–77	.. 4 10 11
4,062,235	,,	,,	4		4 p.c. Con. Pref.	93–96	.. 4 3 4
4,674,850	,,	June 13	3	Coke and	3 p.c. Con. Deb.	72–74	.. 4 1 1
258,740	Stk.	Sept. 11	5	Hastings & St. L.	3½ p.c.	88–90	.. 5 11 1
82,500	,,	,,	6½	Do.	do. 5 p.c.	—	.. —
70,000	10	Oct. 15	11	Hongkong & China, Ltd.		16⅝–17½	.. 6 7 6
131,000	Stk.	Sept. 11	7⅝	Ilford A and C		150–153	.. 4 19 8
65,780	,,	,,	6⅜	Do. B		118–120	.. 5 2 1
65,500	,,	June 27	4	Do. 4 p.c. Deb.		89–91	.. 4 7 11
4,940,000	Stk.	Nov. 13	9	Imperial Continental		162–167	+2 5 7 9
1,235,000	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.		83½–85½	.. 4 1 10
200,242	Stk.	Aug. 28	6½	Lea Bridge Ord. 5 p.c.		118–121	.. 5 3 4
561,000	Stk.	,,	10	Liverpool United A		206–208	.. 4 16 2
718,100	,,	,,	7	Do. B		142–144	–3 4 17 3
306,083	,,	June 27	4	Do. Deb. Stk.		95–97	.. 4 2 6
63,480	Stk.	June 27	3	Maidstone 3 p.c. Deb.		66⅛–68½	.. 4 7 7

Issue.	Share.	When ex-Dividend.	Dividend or Interest & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
75,000	5	June 13	6	Malta & Mediterranean		4½–5	.. 6 0 0
250,000	100	Oct. 1	4½	Met. of Melbourne	4½ p.c. Deb.	96–98	.. 4 11 10
541,920	20	Nov. 27	4	Monte Video, Ltd.		11¾–12¼*	.. 6 10 8
1,775,892	Stk.	July 30	4½	Newc'tle&G'tesh'd Con.		99–100	.. 4 10 0
529,705	Stk.	June 27	3½	Do. 3½ p.c. Deb.		83½–84½	.. 4 2 10
55,940	10	Aug. 28	7/10/6	North Middlesex 7 p.c.		12½–13½	.. 5 11 5
300,000	Stk.	Nov. 27	8	Oriental, Ltd.		12½–125*	+½ 6 8 0
60,000	5	Sept. 26	10	Ottoman, Ltd.		8–8⅜	.. 5 17 8
60,000	50	Aug. 14	13	Portsea, Island B		127–130	.. 5 0 0
100,000	50	,,	12	Do. C		120–123	.. 4 17 7
249,980	5	Oct. 15	8	Primitiva Ord.		5¾–6¼	.. 6 8 0
499,960	5	June 27	5	,,	5 p.c. Pref.	4¼–5⅛	.. 4 17 7
521,600	100	June 2	4	,,	4 p.c. Deb.	93–95	.. 4 4 3
346,198	Stk.	June 27	4	River Plate 4 p.c. Deb.		88–90	.. 4 8 11
275,000	5	Sept. 26	12	San Paulo, Ltd.		—	.. —
150,000	10	,,	6	Do. 6 p.c. Pref.		11–11½	.. 5 4 4
125,000	50	July 1	5	Do. 5 p.c. Deb.		49–51	.. 4 18 0
135,000	Stk.	Aug. 28	10	Sheffield A		222–224	.. 4 9 8
209,984	,,	,,	10	Do. B		221–223	.. 4 9 8
523,500	,,	,,	10	Do. C		220–222	.. 4 10 1
90,000	10	Oct. 15	7½	South African		9¼–10½	.. 7 2 10
6,429,895	Stk.	Aug. 14	5/9/4	South Met., 4 p.c. Ord.		108½–110¼	+½ 4 18 11
1,895,445	,,	July 11	3	Do. 3 p.c. Deb.		72–74	.. 4 1 1
209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.		157–159	.. 5 6 11
952,795	Stk.	,,	6	S'th Suburb'n Ord. 5 p.c.		115–117	.. 5 2 7
60,000	,,	,,	5	Do. 5 p.c. Pref.		113–115	.. 4 6 11
117,058	,,	June 27	5	Do. 5 p.c. Deb. Stk.		115–117	.. 4 5 6
594,740	Stk.	Nov. 13	5	Southampton Ord.		100–103	.. 4 17 1
120,000	Stk.	Aug. 14	7⅜	Tottenham A 5 p.c. and B 3½ p.c.		137–140	+1 5 5 4
543,940	,,	,,	5⅝			115–117	+1 5 0 5
149,470	,,	June 27	4	Edmonton 4 p.c. Deb.		90–92	.. 4 7 0
182,380	10	,,	5	Tuscan, Ltd.		5–6	.. 8 6 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.		96–98	.. 5 2 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.		111–113	.. 4 8 6
30,000	Stk.	Aug. 28	8⅜	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.		155–160	.. 5 4 8
255,636	,,	,,	6⅞	,,	B 3½ p.c.	130–135	.. 5 1 10
108,075	,,	,,	5/17/3	,,	C 3½ p.c.	110–115	.. 5 2 0
352,000	,,	,,	6⅛	Wimbledon 5 p.c.		111–116	.. 5 5 7
98,000	,,	,,	6⅜	Epsom 5 p.c.		115–120	.. 5 10 5
88,416	,,	June 27	3	3 p.c. Deb. Stk.		68–70	.. 4 5 9

Prices marked * are "Ex-Div."

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

MANAGER AND SECRETARY. Flint Gas and Water Company.
DRAUGHTSMAN. No. 5816.
DRAUGHTSMAN. No. 5819.
JUNIOR ASSISTANT. No. 5817.
WORKS FOREMAN. Lancaster Gas Department.
RETORT-HOUSE FOREMAN. No. 5820.
WORKING FOREMAN. Cannock, &c., Gas Company. Applications by Dec. 8.
GAS FITTER. Briton Ferry Urban District Council.
GAS FITTER. Ware Gas-Works.
PUPIL WANTED. No. 5815.

Plant, &c. (Second Hand), for Sale.

MOUTHPIECES, &c., HYDRAULIC PUMPING ENGINE. Devonport Gas Company.
RETORTS AND MOUTHPIECES. Newcastle-on-Tyne Gas Company.

Plant, &c. (Second Hand), Wanted.

GASHOLDER (TEST ROOM). No. 5814.

Gas-Works Wanted.

D.G., c/o Scripps's Advertising Offices.

Patent Licences, &c.

FIXING MANTLES TO BURNERS, &c. Tilley High-Pressure Gas Syndicate, 53, Kingsland Road, N.E.
GAS LAMPS AND HEATERS. C. B. Burdon, 41, Bedford Row, W.C.
GAS METERS. Boult, Wade, and Tennant, 111-112, Hatton Garden, E.C.
GAS REGULATORS. Boult, Wade, and Tennant, 111-112, Hatton Garden, E.C.
OBTAINING GAS FROM TAR, OIL, &c. H. Gardner and ON, 173-5, Fleet Street, E.C.

Journals for Sale.

COWARD and Co., 100, Bishopsgate, E.C.

TENDERS FOR

Fire Clay Goods.

GLASGOW GAS DEPARTMENT. Tenders by Dec. 15.
LEEDS GAS DEPARTMENT. Tenders by Dec. 17.
MANCHESTER GAS DEPARTMENT. Tenders by Dec. 11.

Pipes, &c.

MALVERN URBAN DISTRICT COUNCIL. Tenders by Dec. 23.

Tar.

SHOTLEY BRIDGE GAS COMPANY. Tenders by Dec. 10.

NOTICES TO CORRESPONDENTS, ADVERTISERS AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING FLEET, LONDON." Telephone: 6857 Holborn.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 171, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, FEN. LONDON."
Telephone: 1588 AVENUE (3 lines).

TAR WANTED.

GAS Managers in South West of England are invited to correspond with me respecting Disposal of their Surplus Crude Tar.
I am entirely *outside the Tar Ring*, and am prepared to give you market value for any period.
JOSEPH A. HUTCHISON, LIMITED.

Works:—	Office:—
HIGHBRIDGE WHARF, SOMERSET. (Now Building.)	25, HOLLAND STREET, BLACKFRIARS, LONDON, S.E.

"GUIDE to Patents, Trade Marks and Designs," Sixth Edition, 1913. Send immediately for free copy, giving full and up-to-date information. Chapters on "How to Patent an Invention;" "Warnings;" "Successful Inventions;" "Value of Foreign Rights;" "How to Exploit;" &c. Inclusive fees for this Country and Abroad. J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, LONDON. Established 29 years.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.
GENERAL MANAGERS—
London and South of England:
W. T. P. CUNNINGHAM,
13, Arcadian Gardens, Wood Green, LONDON, N.
North of England, Midlands, and Wales:
J. BROWN & CO., LTD., Savile Town, DEWSBURY.
Scotland and Ireland:
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED.
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

POULTONS & TIMMIS, Ltd.

CARBONIZING and Boiler Setting Engineers, Complete Installations undertaken.
Their Retort Settings are THE best.
GUARANTEED RESULTS.
Registered Office: READING. Telephone: 265 Reading.
London Office: 53, VICTORIA STREET, S.W.
Telephone: 3512 VICTORIA.
Manchester Office: 55, CROSS STREET.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS.
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

OXIDE OF IRON.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
"KLEENOFF," THE COOKER CLEANER.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

TAR WANTED.
THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works,
GRANT STREET, MILES PLATTING, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Oct. 14, p. 186.

ENQUIRIES SOLICITED.

FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS.
C. & W. WALKER, LIMITED,
DONNINGTON, NEWPORT, SALOP.

EDWARD COCKEY & SONS, LTD.
Supply
COMPLETE CARBONIZING PLANTS,
WASHER SCRUBBERS,
PURIFIERS,
SPIRAL OR STANDARD GUIDED GAS-HOLDERS.
Prices and Designs on Application to
THE IRONWORKS, FROME, or
LONDON OFFICE: 39, VICTORIA ST., WESTMINSTER, S.W.

JOHN RILEY & SONS, Limited, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

SULPHURIC ACID — Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two Lines) Nos. 2420 and 2421.